CATALOG OF TSUNAMIS IN THE SAMOAN ISLANDS

by

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Geographical Setting

The Samoan Islands consist of three large islands, Savaii, Upolu, and Tutuila, with several neighboring smaller ones. (Fig. 1) The smaller islands are Aunu'u, Ta'u, Ofu, Olosega, Rose and Swains. The latter two islands are coral atolls. The islands are of volcanic origin and form a chain from east to west from 169.5°W to 172.9°W at the approximate mean latitude of 14°S. The islands rise rapidly from the ocean floor from depths of over 4,000 meters.

American Samoa consists of several islands east of the 171st meridian of west longitude. It is separated from Western Samoa by a Strait which is 60 kilometers wide and over 2,000 meters deep. The main island is Tutuila with an area of 135 square kilometers. There are six smaller islands, Aunu'u, Ta'u, Ofu, Olosega and a small isolated double island, Rose Island, which is uninhabited. The population of American Samoa, in 1977, was 30,600 with the bulk of the population (over 28,000) living in Tutuila and the remainder in Manua and Swain's Islands. More than a third

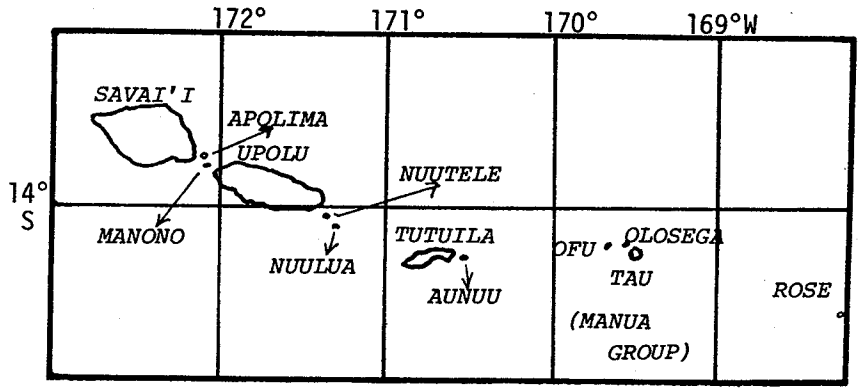


Fig. 1
LOCATION OF THE SAMOAN ISLANDS

of the population (11,000) lives in Pago Pago which is the main town and administrative center of American Samoa. Approximately 2,000 people live in the other town of Leone, about 20 kilometers away. The rest of the population reside in rural communities.

The larger islands of Western Samoa are Upolu (70 kilometers by 20 kilometers), and Savai'i (70 kilometers by 50 kilometers). The smaller islands are Nuutele and Nuulua, on the eastern end of Upolu, and Manono and Apolima, between Upolu and Savai'i. The strait separating Upolu and Savai'i is 15 kilometers wide and about 100 meters deep. The islands are surrounded almost entirely by coral reef of several kilometers in width. The principal town of Western Samoa and the capital, Apia, is situated on the north coast of Upolu Island. The total area of Western Samoa exceeds 2,900 square kilometers. Western Samoa is an independent state and a member of the British Commonwealth. Its population as of 1977, was 152,000. Approximately 109,500 people inhabit Upolu and approximately 42,000 inhabit Savai'i.

History

Archaeological excavations in Western Samoa revealed Lapita pottery dating back to about 800 B.C. Therefore, it can be assumed that all of the Samoan Islands have been inhabited by men over 2,500 years.

Contact with the western world was first made in 1722 when the Dutch navigator Jaco Roggereen of the Dutch West India Company sighted the Manua islands, Tau, Ofu and Olosega, and had brief contact with the Samoans. Forty-six years later, in 1768, the French explorer Louis Bougainville, touched at the Manua's in his voyage around the world and bartered trinkets for fresh food. He was struck by the manner in which the Samoans handled their boats that he named the islands "the Navigator Islands". In 1787, another French explorer, La Perouse, visited the islands. During the visit, his second in command, de Langle, and eleven of his men were massacred when they went ashore for water. Four years later, the Englishman Captain Edward Edwards of the British war vessel, Pandora, stopped on two occasions during his search for the mutineers of the "Bounty".

From about 1803 and thereafter, many sailors and escaping convicts from New South Wales began to reach the Samoan islands from Tonga and elsewhere. By 1830 many people of European origin had settled in the Samoan islands. In 1830, the first Christian missionaries, John Williams and Charles Barff, of the London Missionary Society arrived and left Tahitian teachers ashore. In 1836, the Rev. A.W. Murray settled on Tutuila, remaining there for many years. Pago Pago harbour had been discovered a few months earlier by Captain Cuthbert of the British whaler "Elizabeth". Pago Pago soon thereafter became a popular port of call for whaling vessels of many nations.

The United States Navy made the first scientific investigations in the islands in 1839. As early as 1850, England, Germany, and the United States were represented by commercial agents in Apia. During the next 20 years, Germans and Englishmen were more forward in developing and establishing close relations with the natives. Americans took very little interests at this time.

Recognizing the usefulness of Pago Pago as a port for the proposed trans-Pacific steamship service, American shipping interests took steps to obtain a foothold there. In 1872, Commander Richard W. Meade of the United States Navy signed a treaty with the Mauga (high chief) at Pago Pago area which gave the United States the exclusive right to build a naval station in return for U.S. Government protection. The treaty was made only on Meade's own responsibility. Later that year, President Grant communicated this agreement to the Senate which gave no action on the agreement. Finally, in 1878, a treaty which contained the formal definition of the relations of the United States and the Samoan group was ratified. The United States was granted the priviledge of entering and using of Pago Pago, and establishing a coal station there. During the next 20 years, the Samoan islands were the subject of power struggles between the United States, Germany and Great Britain.

In 1899, treaties were drawn between the three powers to partition the islands. Western Samoa was placed under Germany; United States

accepted Tutuila and Manua; and Great Britain withdrew from the group in return for German concessions elsewhere.

The American territory was placed under the jurisdiction of the United States Department of the Navy from 1900 to 1951. The United States flag was formally raised on Tutuila on 17 April 1900 following the receipt of a deed of cession from the chiefs of that island. The Manua chiefs signed a deed of cession in 1904. In 1911, American Samoa was adopted as the name of the territory. In 1951, administration was transferred to the U.S. Department of the Interior.

Tsunami History

Searching for historical tsunamis in the Samoan Islands turned out to be a difficult task. The Samoans had no written language. Their myths and history were preserved in memory only. The written record does not begin until 1830 when the first missionaries came to the Samoan Islands. Little is known of the Samoan Islands prior to that, although several Europeans touched on the islands briefly a few decades earlier. The tsunami history was researched by going back to all historical publications and to archival records. The following is an account of historical publications used in the search.

In 1830, the London Missionary Society established a mission in one of the Samoan Islands and followed that up by extensive operation in all the islands. From March 1845 to 1862, the London Missionary Society published twice a year the Samoan Reporter (Upolu, Western Samoa). Then in July, 1890, the missionary journal O le Sulu Samoa (in Samoan language) was started reporting monthly news and information. The Royal Gazette (Apia, 1892-1893) was the official gazette. Samoa Times (Apia) began its publication in April of 1901, in English and German until 1917, and stopped publication in February 1930. It was revived again in June of 1964 (English and Samoan)and later it absorbed the Samoa Bulletin (Nov. 1950 - May 1967) and is still currently being published in Western Samoa.

Western Samoa Gazette started in May of 1920 by the New Zealand Administration as the official gazette and is still continuing with the same title by the Western Samoan Government. Savali (Apia), is published by the Government of Western Samoa beginning September 1 of 1905 as a monthly publication and then later in 1970 as a biweekly publication.

In American Samoa, the oldest newspaper, titled O le Fa'atonu o le Kolone o Unaite Setete Tutuila ma Manua, began in 1903. It was the official gazette in Samoan and English until 1955. Samoa News (Pago Pago) began publication in April of 1963 and lasted to 1966. The Office of Samoan Information of the Government of American Samoa published five times a week the News Bulletin starting July 12, 1965 and is still continuing up to the present time. Samoa News (Pago Pago), different from the original Samoa News (1963-1966), started publication on August 6 of 1969 and is still one of the current newspapers in American Samoa. The following is a list of periodicals that have been used for information in searching for historical tsunamis. Both national and local newspapers were used.

Honolulu Advertiser	1900 to present
Honolulu Star Bulletin	1900 to present
New York Times	1861 to present
News Bulletin for the People of American Samoa	1967 to present
O le Fa'atonu	1903 - 1955
O le Sulu Samoa	1890 - 1897
Pacific Islands Monthly	August 1930 to July 1945
Samoa Bulletin	1950 - 1967
Samoa News	1963 - 1966
Samoa News	1970 - 1979

Samoa Times	1901 - 1930
Samoan Reporter	1845 - 1860
Samoana	May 1960 to March 1967

None of the Samoan newspapers provide indexes, therefore, to locate articles on any topic, manual search of each issue is required. In locating primary source of information for tsunami events, the dates of earthquake or known tsunami were first established, then a search of the newspapers available for these particular dates was initiated.

Search for the project initially began at the Hawaiian and Pacific Collection of the University of Hawaii Library. A handful of relevant journal articles and reports were located. Bibliographies from these articles were reviewed and provided further references. Several other bibliographies on the Pacific Islands and on Samoa were used to locate relevant publications. A list of these bibliographies can be found in Appendix I.

The Hawaii State Archives were reviewed but nothing was found pertaining to tsunamis in Samoa. The Bishop Museum archival and manuscript records were also thoroughly checked and some information on one historical tsunami was found. An annotated list of archival materials from approximately 1850 to 1925 found at the New Zealand National Archives indicates some reports on early exploration and on volcanic eruptions in Samoa. Mr. Norman Ridgway of the New Zealand Oceanographic Institute has helped in searching for material in the New Zealand National Archives for references to tsunamis in the Samoan Islands and found records of a few tsunami events (May 2,1917, June 25, 1917, September 8, 1918, April 30, 1919, and February 4, 1923). Ms Lynette Hunter of the Office of Library Services of American Samoa Government has also helped in the search. However, no relevant materials has been located.

Scientific abstracts and indexes relevant to earthquakes, tsunamis, and geology were also reviewed. Since there are no cumulative indexes available in most cases, the search was done manually for each year. A computer search was thought to be an alternative which could have eliminated the manual task and could have provided more efficient searching of materials. However, it was found that most of the computer data base began only in the early 70's and therefore, was not useful in historical searching.

Several tsunami catalogs have been utilized to extract events of tsunamis in Samoa (Iida, et al, 1967; Pararas-Carayannis, 1977; Wigen, 1977; Heck, 1947; Keys, 1957) The U.S. Earthquakes published by the U.S. Geodetic Survey, and the Annual Summary of Information on Natural Disasters published by UNESCO are also used in locating events. Some of the most current events are found in the Tsunami Reports published by the International Tsunami Information Center. The most helpful source of primary information was provided by Mr. Seve Iosa of the Apia Observatory. Reports from the Apia Observatory provide detail accounts in Western Samoa for some of the events with high tsunami waves. In addition, the microfische collection of tsunami mareograms (March 1952 to December 1975) was also thoroughly searched and a number of events which occurred in Pago Pago were found.

Sixty tsunami events were located. The following are detailed narrative descriptions of the different events discussed given in chronological order and followed by a catalog listing.

November 7, 1837

Account of this event was found in Hitchcock's Hawaii and its Volcanoes where it records,

> *On the 7th of November 1837, there was an earthquake in Chile, and a sea wave started by it was felt at the Hawaiian Islands; also at Tutuila in the Samoan Group.* (Hitchcock, 1911)

No other information concerning this tsunami and its other parameters in Samoa could be found.

August 14, 1868

The great "Peru" earthquake and tsunami on August 13, 1868 destroyed settlements in Apia according to the Preliminary Catalog of Pacific Tsunamis.(Iida, et al, 1967) No other detail could be found to verify this. No primary source of information is available for this year.

May 10, 1877

The May 10, 1877 great Chilean tsunami that caused devastating damages throughout the Pacific was also observed at Apia. According to the Preliminary Catalog of Pacific Tsunamis, the maximum height there was from 2 to 4 meters. (Iida, et al, 1967)

No primary source of local information could be located. The holdings of Samoa Times at the University of Hawaii Library began in 1901 and the Samoan Reporter is available from 1845 to 1860 only.

March 24, 1883

The New York Times reports,

> *Captain Pearson, commanding the Wachusett, in a report from Apia, Samoan Islands, gives a description of a storm accompanied by shocks of earthquake which visited the Samoan group on the night of March 24... The east end of the Island of Savaii was visited by a tidal wave which swept away all houses within a quarter of a mile of the beach for a distance of 15 miles along the shore...* (Anon., 1883)

According to the Catalog of Tsunamis in the Pacific (Soloviev & Go, 1969) and Catalog of Tsunamis in Eastern Part of Pacific Ocean (Soloviev

& Go, 1975), there was an earthquake on March 24, 1883 in the Samoa Islands. However, no other detail on the exact location of the quake and damage was provided.

June 15, 1896

A letter from William Churchill, Consul General of the U.S. at Apia, Samoa to the Hydrographer of U.S.N. dated September 2, 1896 reads as follows:

> *Sir: I have the honor to report for your information the fact of a tidal wave felt in this group at the latter part of June, information of which has just been brought to this office.*
>
> *My reporters are Samoans and I have found it impossible to obtain from them an exact statement as to the day of the month on which this phenomenon was witnessed. Omitting, therefore, of necessity, this important detail their account is as follows. The tide was at the customary height of slack water flood in the morning of this particular day. After it has run ebb for a short time, apparently not much more than one hour, great waves were seen outside the reef and the water ceased to fall. There was a slow rise during all the period of ebb, the great waves continued at long intervals, the tide at the time which should have been slack water ebb was higher than it commonly is at high water springs by at least a foot. This would correspond to the height of five and one half feet above mean low water. It lasted during one whole period of ebb tide and is characteristically described by my Samoan reporters in the terms "low water was a foot higher than high water".*
>
> *No damage was done by the strange tide except the carrying adrift of a few canoes beached not quite high enough. But considerable alarm was manifested over the unusual circumstance and I have been asked if it will not return with greater force and carry away the houses built on the beach just above high tide.*
>
> *This had been reported in consistent terms from several places along the north coast of Savaii. At Iva, also on the north coast but rather more in toward the strait between Savaii and Upolu, the resident trader informs me that he noticed nothing of the sort. I have inquired generally as to the south coast and find that nothing was noticed of the sort since the earthquake shock of Christmas day last year.*
>
> *No such phenomenon was noticed in Apia, on the north coast of Upolu, and as the German man of war "Folke" was lying in the harbor it is very likely that its trained officers would not have permitted such a thing to escape their notice if it has happened.* (Churchill, 1896)

No exact date in the month of June is specified in the letter. Several destructive tusnamis occurred on June 15, 1896 in Kamaishi, northeast Japan, according to Heck. (Heck, 1947) The only periodical source available in Hawaii covering this period is the "O le Sulu Samoa" published by the London Missionary Society. However, the publication is written in the Samoan language and it is not known whether any information about this event is reported.

1905 - 1911

The Matavanu volcano eruption first began on August 4 of 1905. The flows occasionally generated small tsunamis by avalanching material into the sea according to Sapper. (Sapper, 1927; Richard, 1962) Several tsunami-like waves were observed when the crater was more than usually active.

> *It is interesting to note that several so-called 'tidal' waves have occurred during the eruption. The following were noticed at Matautu by Amtmann Williams:--*
>
> | | |
> |---|---|
> | *November 28th, 1906* | *5:30 p.m.* |
> | *June 8th, 1907* | *at noon* |
> | *June 19th, 1907* | *3 a.m.* |
> | *June 27th, 1907* | *between 6 & 7 p.m.* |
> | *July 9th, 1907* | *6:45 p.m.* |
> | *July 25th, 1907* | *11 a.m.* |
>
> *The tide usually rises and falls about 4 feet at Matautu. Most of these waves did not exceed 6 to 8 feet in height, and as many of them occurred at low or half-tide, and there was no heavy sea on at the time, little damage was done, althought in several cases the main road of the town was flooded.* (Anderson, 1910)

October 6, 1907

According to Anderson (1910), the largest and most important tsunami that was caused by the Matavanu volcano eruption occurred on October 6, 1907 at about 5:30 p.m. local time.

> *The largest and most important of the series was that on Sunday, October 6th, 1907, about 5:30 p.m. It was just at the time of high water, but the sea was smooth. The wave was 10 or 12 feet high; it came from the north-east round the lave-point, as in fact the others had done, and at the Deutsche Handels & Plantagen Gesellschaft's place a boat-house was wrecked, a buggy in it smashed, and several boats were damaged; while, at a house a few score yards off, a 400-gallon tank of water was lifted bodily from its foundation and carried across the road. The wave appears to have spent itself here and, it was thought, probably rebounded out to sea.*

No damage was done at the Government Offices, 150 yards distant, nor in either direction along the coast.

The wave was noticed, but of smaller size, in some of the other islands. At Apia it had a height of only 1 or 2 feet. It was probably connected with the lava falling into the sea, but the exact cause was uncertain. Possibly it was due to a steam-explosion. (Anderson, 1910)

February 11, 1915

The New York Times (13 Feb. 1915) reported the following:

Not only a hurricane, but with it an earthquake and a tidal wave, swept the Manua Islands of the Samoan group...

Fuller details received today show that three persons were killed. One of these was beheaded by flying wreckage. Entire villages disappeared. Those of which traces remain were ruined. All shipping was either destroyed or badly damaged. Three-fourths of the cocoa palms on which the islands depend for nourishment and their commerce on copra, were leveled, and all the remainder were injured. Some plantations were wiped out. It will be a year before any food plants can be brought into bearing again. Three thousands inhabitants are destitute. The American gunboat Princeton is conveying food, clothing and temporary assistance, but the need for further aid is urgent, as the food supply is so low that starvation will set in before three weeks are out.

The South seas have known hurricanes before, but the situation left in the wake of this storm is described as unprecedented. At the height of the storm the fury of the winds was unbelievable. Iron roofs were torn off and blow three miles. The very soil was torn from the coral rocks, and the coffins in new-made graves were left exposed. (Anon., 1915)

No seismic activities were recorded for that period in that vicinity. No local newspaper articles reporting a hurricane or earthquake could be located. It is not known whether the "tidal wave" reported in the New York Times was indeed a tsunami generated by a local earthquake or high surge caused by the hurricane. The absence of any information on an earthquake or a tsunami elsewhere in the Samoan Islands suggests that the latter was the case.

May 1, 1917

Heck lists this event in his 'List of Seismic Sea Waves' as follows:

Earthquake at 20.2°S, 177.0°W. Forty-foot wave at Samoa. Pronounced wave recorded at Honolulu and West Coast of United States. (Heck, 1947)

The reference to the above statement came from International Seismological Summary, 1913-1934. (Anon., 1913) Copy of this Summary cannot be located in the University of Hawaii Library to verify the statement. Searches were carried out in the local newspapers "O le Fa'atonu" from Pago Pago; and "Samoa Times" from Western Samoa for that particular year (1917). No newspaper articles relating to a forty-foot wave or any indication of tsunami could be found for that month (May).

From the "Preliminary Catalog of Tsunamis Occurring in the Pacific Ocean", there is an earthquake recorded at 29°S and 177°W on May 1 with a magnitude of 8.0 at Kermadec Island. According to this catalog, a tsunami was observed in the Samoan Islands and is reported as follows:

Recorded. 12 m. height reported by Heck is probably confused with height of June 25 tsunami. (Iida, et al, 1967)

No record of this tsunami from Apia gauge was found. No other reference has been located thus far giving the actual height of the tsunami. The absence of any information in local papers is indeed strange, considering the magnitude and location of the earthquake.

June 26, 1917

Heck lists this June 25 event as follows:

Samoa. Destructive earthquake and 40-foot tidal wave. Recorded at Honolulu and on West Coast of United States. (Heck, 1947)

Reference to the above statement was found in "First Pan-Pacific Scientific Conference, 1921", which states the following:

Important earthquakes occur in American Samoa, giving rise to tidal waves; a destructive one occurred in June 1917. There the earthquakes do not take place in the immediate neighborhood, but arise in Tongan Deep. The wave in 1917 was 40 feet high. (Anon., 1921)

Mayor mentioned in his paper on "Causes which produce stable conditions in the Depth of the Floors of Pacific Fringing Reef-Flats" the following:

The only unusual disturbance appears to have been due to the earthquake wave on the night of June 25, 1917, when the harbor-water suddenly sank about 3 feet above high tide, oscillating several times with decreasing amplitude. (Mayor, 1924)

It is not known to which harbor he is referring to, but it is assumed to be Pago Pago. Report from records of Apia Observatory list the following:

1917 June 25: Earthquake about 150 miles S 20°W from Apia. Magnitude = 8.4. Destructive tsunami on south coast. At Apia Harbour, the wave arrived at about 0555 G.M.T. maximum range about 80 cm, period about 18 mins. (Apia, 1980)

A copy of the marigram from the Apia gauge is available.

The 'Samoa Times' of June 30, 1917 reports the following:

As might have been expected... the earth tremors were accompanied or succeeded by a tidal wave which was observed all around the coast, but the full force of which was greatly minimized by the reef and also by the fact that the earthquake occurred coincident with low water. Nevertheless the accounts emanating from Lotofaga, if not exaggerated, are sensational to a degree... Dr. Angenheister in his report gives particulars of his observations at the Custom House Wharf, though the record here must have been considerably modified by the comparative shelter the spot enjoys...

On the Aleipata coast the tidal wave is described as sweeping in, a white wall of foam fully 10 ft. in height. Although dead low water at the time, the advancing wall of water swept over high water mark and across the beach into adjacent native houses, carrying everything before it. In some of the houses, mats, etc., stored several feet above ground, were washed away... At one point on the beach above high water mark a number of coconut tree logs, which had lain there unaffected by the highest and strongest tides, were lifted clear up and carried several yards from their original position...

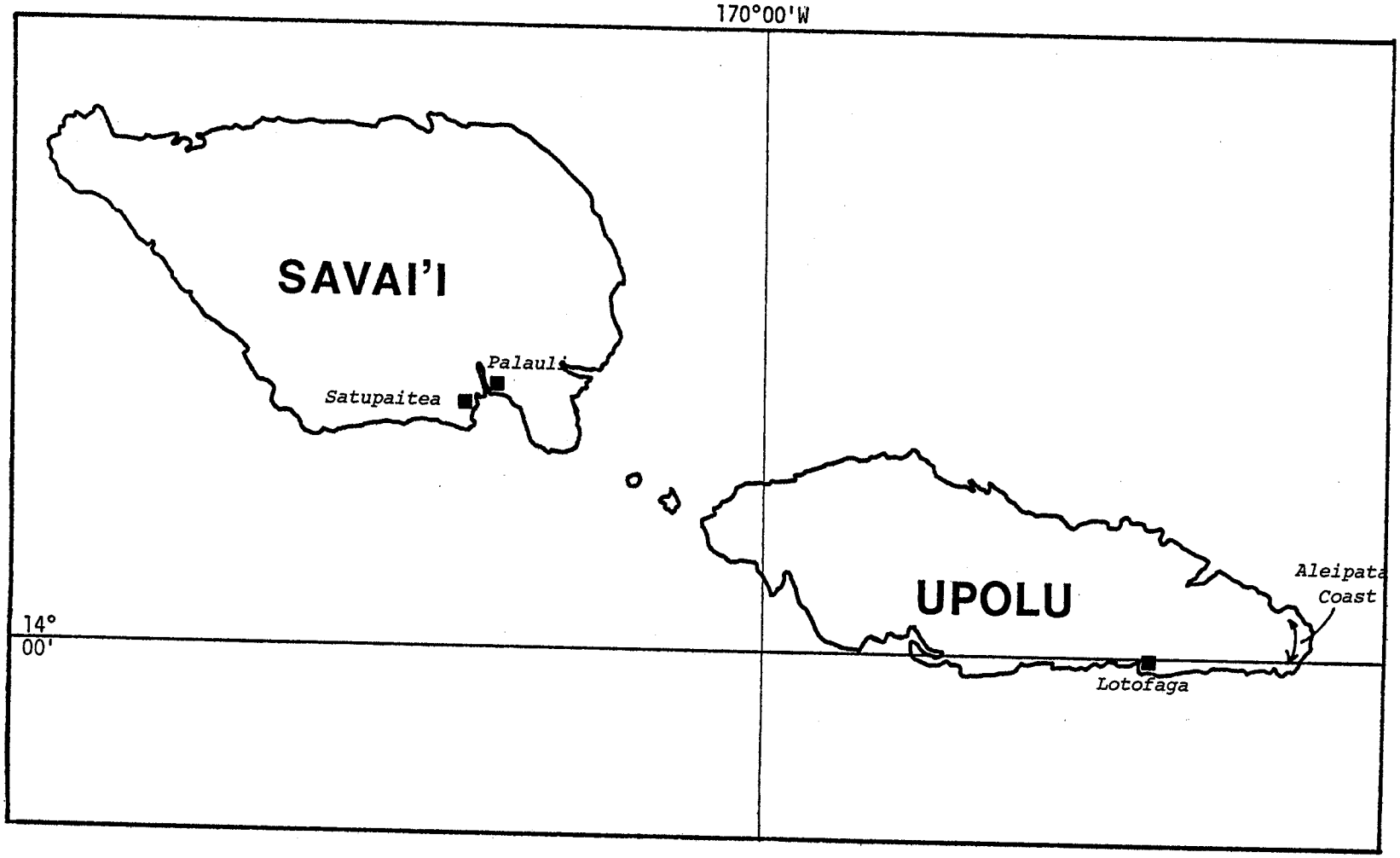
In Lotofaga... the tidal wave swept right over the beach, flooding the houses and reaching out into the plantations at the rear. About two chains of solid cement wall, quite a foot thick and three feet high, was lifted up bodily and carried away, pieces weighing over half a ton being shifted back for fully 30 feet. Another account says that quite half the village was submerged and the houses destroyed.

... In Savai'i the tidal wave experienced was of an alarming character. At Palauli a bridge was washed away, and a number of native houses destroyed. At Satupaitea, a copra house was caught by the wave and carried down the coast for about a quarter of a mile, and here all native houses were demolished.

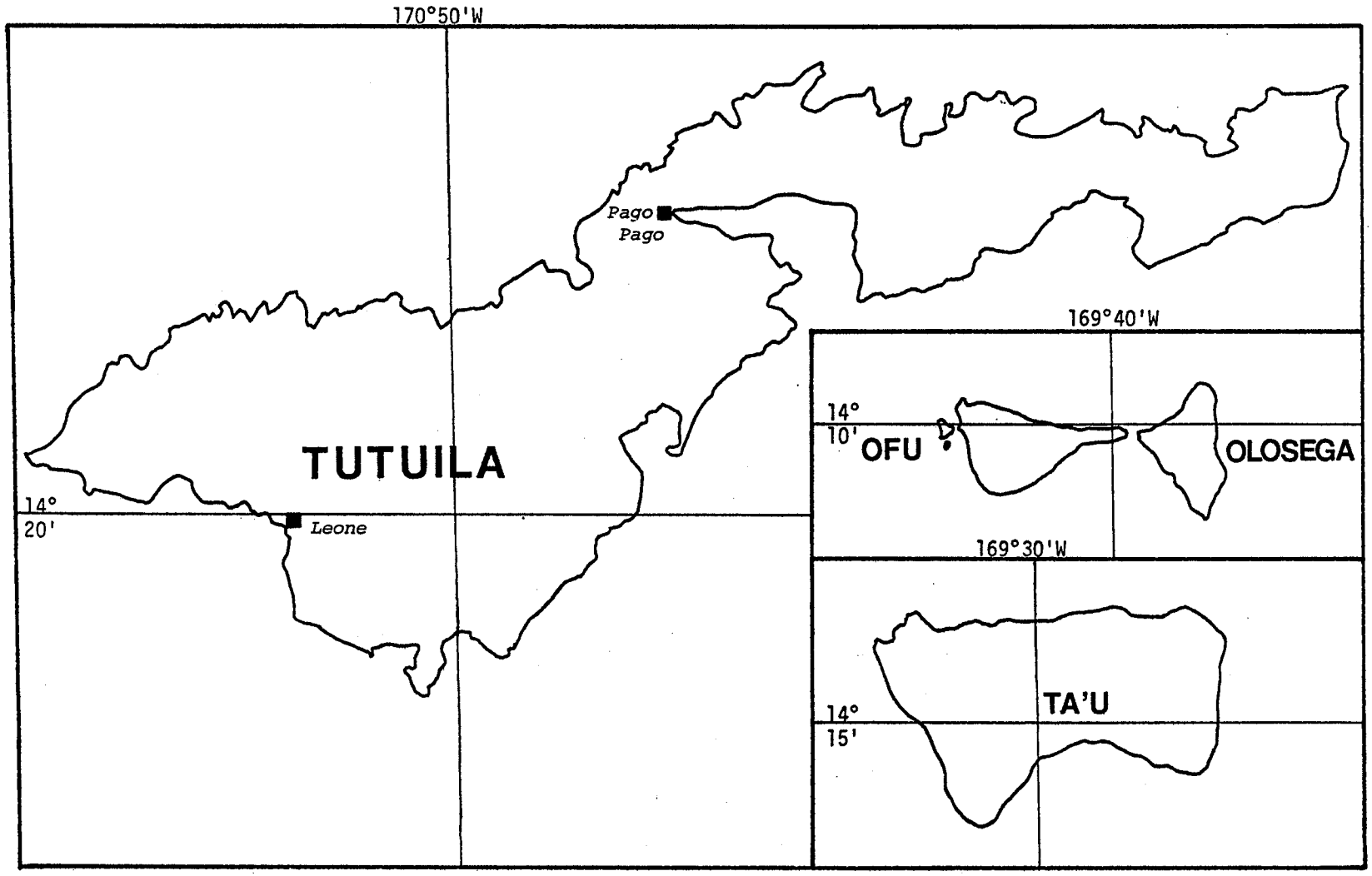
... In Tutuila a small tidal wave swept in through Pago Pago destroying many Samoan houses. Most of those living in Pago Pago took to the hills. (Anon., 1917a)

The following is the account from the "O le Fa'atonu" of July 1917 from American Samoa:

Affected Areas by
Tsunami of June 26, 1917
in Western Samoa



Affected Areas by
Tsunami of June 26, 1917
in American Samoa



The fear experienced from the violence of the tremors, is not to be compared with that experienced by the subsequent tidal wave. A few minutes after the quake ceased, the water began to leave Pago Pago Bay rapidly, falling about six feet. The return of the water resembled a small tidal wave at the head of the bay and there the water may have reached a height of six to eight feet above normal. No injuries occurred. There was much damage of minor importance, the most important being the damage to two large churches, which were partly demolished -- the Mormon Church in Pago Pago and the Catholic Church in Leone. Many of the natives around the bay sought refuge in the mountains where they remained until morning. (Anon., 1917b)

September 7, 1918

Records of Apia Observatory in Western Samoa have the following information on this event.

1918 September 7: Earthquake in the Kuril Is., about 7,500 km from Apia. Seismic register gives arrival time of Tsunami at Apia as September 8th at o223 G.M.T., from which is calculated a velocity of 229 m/sec. Maximum range about 40 cm. Period about 20 mins. (Apia, 1980)

The Samoa Times (Anon., 1918) reported that an earthquake was recorded at the Apia Observatory. Though it was generally not felt in Samoa, it was followed by a tidal wave observed at several points along the shores. The tide gauge record at Apia Harbour showed that the wave began a few minutes before 3 o'clock P.M. local time (Sept. 8). The maximum perturbation of the sea level was 18 inches, and the period 15 to 20 minutes. At Sogi, about 3 hours later, the water suddenly receded and later came rushing back at least a foot higher than before. At Safune of Savaii, it was reported that the same phenomenon occurred as in Sogi.

No reports from American Samoa newspaper can be found on this event.

April 30, 1919

Heck's list reports the following:

1919 April 30. Tonga Islands. Recorded on Apia, Honolulu, and California tide gages. (Heck, 1947)

Mayor's paper on "Causes which produce stable conditions in the Depth of the Floors of Pacific Fringing Reef-Flats" also reported this event as follows:

... it may also be of interest to state that Tongan earthquake of April 30, 1919, produced quite similar oscillations of sea-level in Pago Pago Harbor. (Mayor, 1924)

Reports from the Apia Observatory, Western Samoa, (Apia, 1980) showed that first wave arrived at Apia at 0812 G.M.T. Greatest height was 37 cm. The Samoa Times (Anon., 1919a) reported an earthquake occurrence but no details of the tsunami were given.

O le Fa'atonu (Anon., 1919b) reported that the quake was also followed by the tidal waves in Tutuila. The water receded about six feet below the low water mark, and when it returned it attained a height of six or eight feet above high water. No indication of where the tidal waves occurred on the island of Tutuila was provided.

August 1920

Heck's listed:

> *1920 August. Samoa. Earthquake and tidal wave at Pago Pago.* (Heck, 1947)

Reference to the above comes from a report of the First Pan-Pacific Scientific Conference in 1920 where several scientists were having discussions. Mr. Mayor, one of the participants said,

> *Recently at Pago Pago an earthquake was followed in half an hour by a wave.* (Anon., 1921)

According to the Preliminary Catalog of Pacific Tsunamis occuring in the Pacific Ocean,

> *Heck's reference to an earthquake and tsunami are almost certianly mistaken. No quakes were recorded at Apia according to Keys (1957). The Apia record mentions no tsunami. Probably, a confused re-entry of the September 21 tsunami.* (Iida, et al, 1967)

No primary sources from local newspapers have recorded this event.

From the Apia Observatory (Apia, 1980), the seismic register did not mention any tsunami, nor were there any outstanding local earthquakes near the month of August. In conclusion, this was an erroneously reported event.

September 20, 1920

An earthquake occurred in the vicinity of New Hebrides on 20 September 1920. The first sea wave to reach Apia was at 1904 hours. Unfortunately, no tide gauge record at the Apia Observatory is available. (Apia, 1980) No other primary source of information could be located. No reports concerning this tsunami were found in the O le Fa'atonu from American Samoa or the Samoa Times from Western Samoa. (Heck, 1947) (Iida, et al, 1967)

November 11, 1922

According to the reports from Western Samoa, the first sea wave reached Apia at 1836 hours. (Apia, 1980) The Preliminary Catalog of Pacific Tsunamis (Iida, et al, 1967) indicates slight damage in Pago Pago. However, no other sources were found to verify this. No reports were found in the Samoa Times of Western Samoa nor from O le Fa'atonu of American Samoa.

February 3, 1923

The Apia Observatory records (Apia, 1980) show that the first wave reached Apia on February 4 at 0142 G.M.T. after the tsunami at Hawaiian Islands on February 3.

The Samoa Times (Anon., 1923) reported that a tidal wave was recorded by the tide gauge but the rise and fall of the water was small. No other information for Western Samoa or American Samoa could be found.

March 16, 1926

Heck indicated an earthquake at 16°S and 171°W (Samoa?) which caused tidal wave and swept over Palmerston Island (19°S, 162°W). (Heck, 1947) This was cited from a report of 30 June which recorded that the incident occurred about three months earlier. (Iida, et al, 1967)

The Apia tide records are available but no tsunami was recorded, and no notes appear in the seismic register. According to the Apia seismic records, this earthquake was 150 miles from Apia in direction S 14°W and was felt R.F. 4. Palmerston Island is about 750 miles from Apia in direction S 60°E. There was a cyclone 150 miles north of Apia on January 1. (Apia, 1980) The Preliminary Catalog of Pacific Tsunamis indicates that the storm was centered 15 miles north of Apia. The 15 miles distance is probably an error.

Doubtful tsunami.

June 17, 1928

The Apia tide gauge record (Apia, 1980) showed that first wave began at about 0450 local time in a period of about 20 mins. About three prominent cycles appeared on the mareogram.

No other sources of information could be located concerning detail of this event.

June 3, 1932

The Apia Observatory tide gauge recorded this event at about 1045 local time. The period was 20-25 mins. and the range was about 2 1/2 inches. (Apia, 1980)

No report was found in O le Fa'atonu of American Samoa. The Samoa Times of Western Samoa for 1932 was not available.

March 2, 1933

The event was recorded at Apia. No other detail could be found. O le Fa'atonu had no reports about this event and Samoa Times is not available for this year. (Apia, 1980)

December 7, 1944

Newspaper accounts cannot be found in O le Fa'atonu and Samoa Times is not avaialble for this year. However, a small tsunami was recorded by the Apia tide gauge. Prominent weak waves, 2 inches in range began at 11 h 00 m with a period of 20 minutes. The waves may have lasted until 09 h but the trace is too weak. (Apia, 1980)

April 1, 1946

Records of Apia Observatory state the following:

> *1946 April 1: Aleutian Is. First sea wave at Apia at 21h 43m G.M.T. was a recession. The period was 25 mins. There is also a reflection from the California Coast, arriving at Apia at April 2nd 02 08 G.M.T. causing an apparent period of 10-15 mins. Apia record available.* (Apia, 1980)

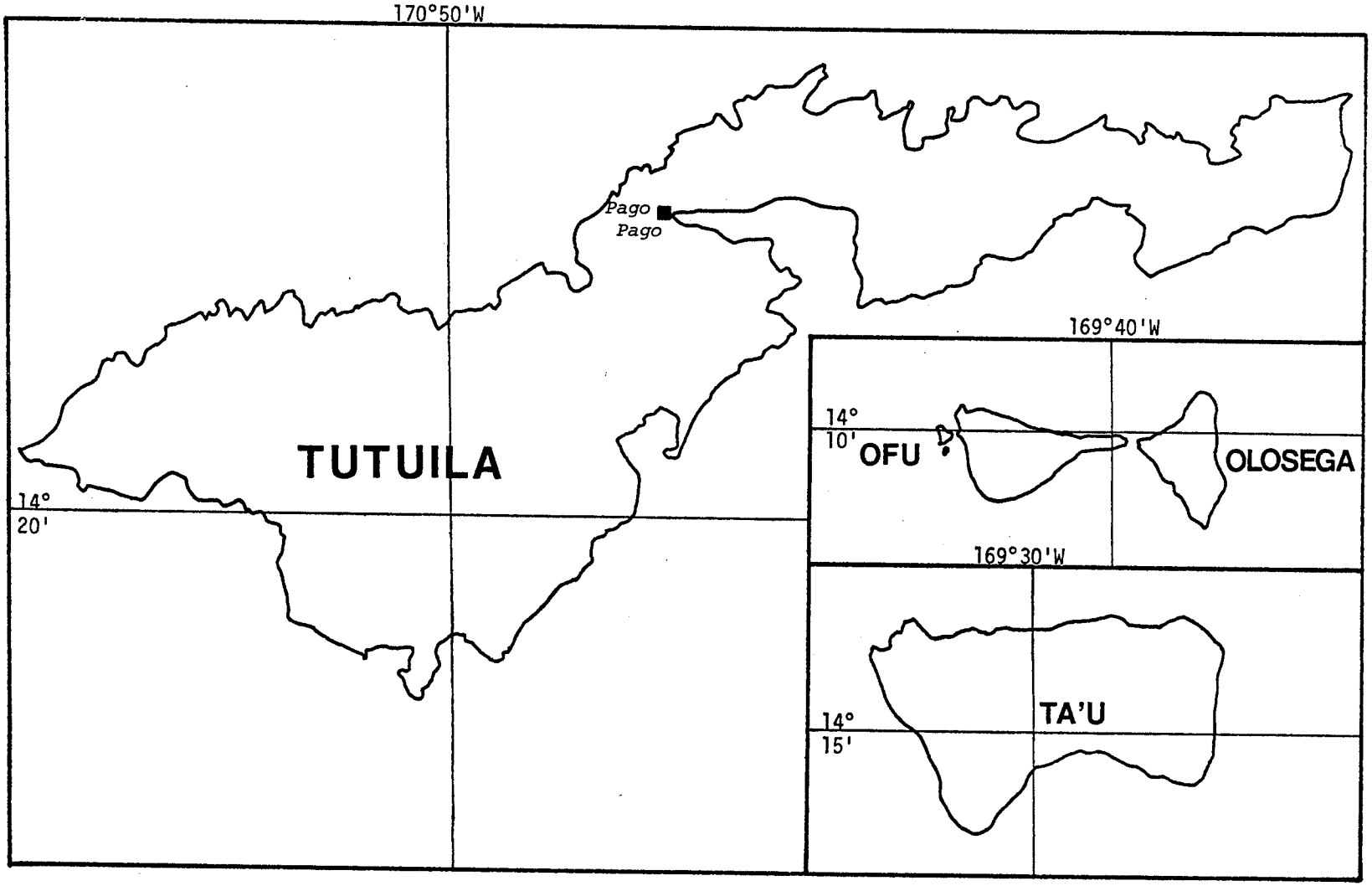
Local newspapers from American and Western Samoa for the year 1946 are not available from the University of Hawaii Library. Thus, no primary source of the account is located. However, an article from Honolulu Advertiser dated April 19, 1946 states:

> *Several huts in the village of Pago Pago, Samoa, were washed away by the tidal wave which swept across the April 1 according to officers of the MV Honda Knot which arrived at Pearl Harbor Wednesday from Samoa... In that port, the officers said, the rise and fall of the harbor as the wave struck was about five feet.* (Anon., 1946)

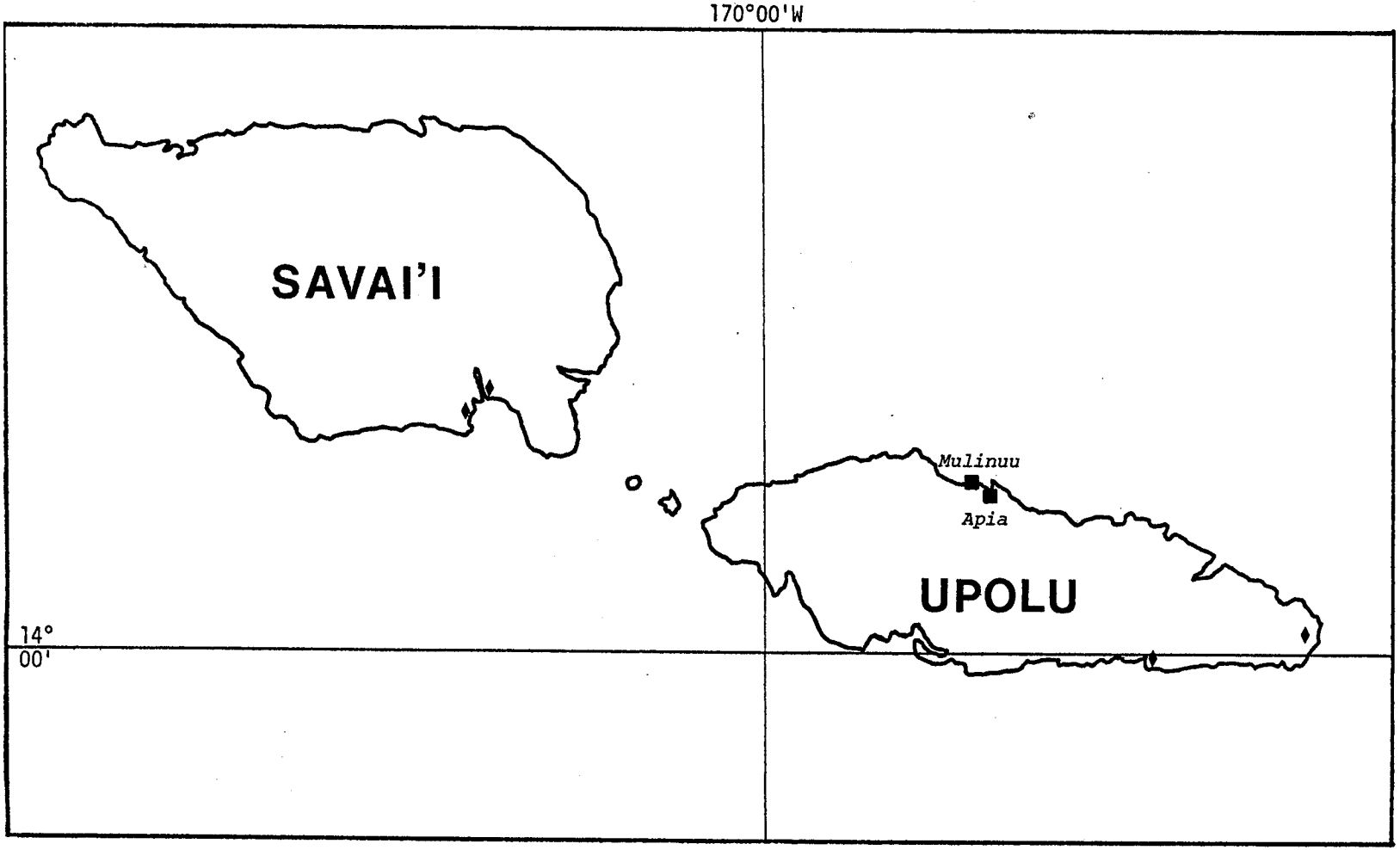
From the Apia Observatory records, the following is an extract from a letter in the Observatory file about this event.

> *Commencing at 10:30 a.m. local time on April 1st, the Apia Harbour was almost drained of water, leaving the inner reef quite dry. This was followed by an inrush completely filling the harbour as at high tide, the range being approximately 8 ft. This phenomenon occurred six times between 10:30 and 12:40 p.m., the time of low tide. When the tide was on the "make" the phenomenon was less noticeable except as a series of "swells" which were larger than usual. The level at high*

Affected Areas by
Tsunami of April 1, 1946
in American Samoa



Affected Areas by
Tsunami of April 1, 1946
in Western Samoa



tide was very high, and in some cases the sea encroached on the road, which is exceptional, even at spring tides.

At Mulinu'u by the Observatory, nothing unusual was noticed until the tide was on the turn. This was presumably due to our being protected by the reef which at low tide is entirely uncovered. The ingress of waves from the open sea was stopped by the reef, while tidal waves coming from the harbour did not have sufficient energy to traverse the lagoon as far as the Observatory. However, in the afternoon the series of "swells" were observed. These were recorded on our tide gauge, with amplitudes just under one foot. (Apia, 1980)

No information from any other locality has been obtained concerning this tsunami.

September 8, 1948

The only reference relating to this event is found in the Preliminary Catalog of Tsunamis occurring in the Pacific Ocean. It is listed that the September 8, 1948 earthquake in Tonga (21°s 174°W) with a magnitude of 7.8 generated a tsunami of 0.1 m with a period of 17 minutes at Pago Pago. (Iida, et al, 1967) This is probably taken from a tide gauge record. No reports from O le Fa'atonu could be located. The Samoa Times for this year was not available at the University of Hawaii Library.

March 4, 1952

An earthquake occurred in Tokachi, Hokkaido of Japan generated local tsunamis and in Hawaii and elsewhere. A minor trace of tsunami was also recorded at the tide gauge of Pago Pago. (Microfische Collection of Tsunami Mareograms 1952-1975)

March 10, 1952

An earthquake with a magnitude of 7.1 in S.E. of Hokkaido, Japan caused a minor tsunami recorded at the tide gauge at Pago Pago. (Microfische Collection of Tsunami Mareograms 1952-1975)

March 17, 1952

A minor trace of tsunami was recorded at the tide gauge at Pago Pago due to the earthquake occurred off the shore of the Island of Hawaii. (Microfische Collection of Tsunami Mareograms 1952-1975)

March 19, 1952

An earthquake occurred in Mindanao of the Philippines with a magnitude

of 7.75 in the Richter scale caused a minor trace of tsunami recorded at the tide gauge of Pago Pago. (Microfische Collection of Tsunami Mareograms 1952-1975)

May 13, 1952

A minor trace of tsunami was recorded at the tide gauge of Pago Pago after the earthquake of May 13, 1953 in Costa Rica. (Microfische Collection of Tsunami Mareograms 1952-1975)

July 13, 1952

According to Iida, et al, 1976, no evidence to support tsunami generation by the earthquake that occurred in New Hebrides can be found. However, a minor trace of tsunami was recorded at the tide gauge of Pago Pago. (Microfische Collection of Tsunami Mareograms 1952-1975)

November 4, 1952

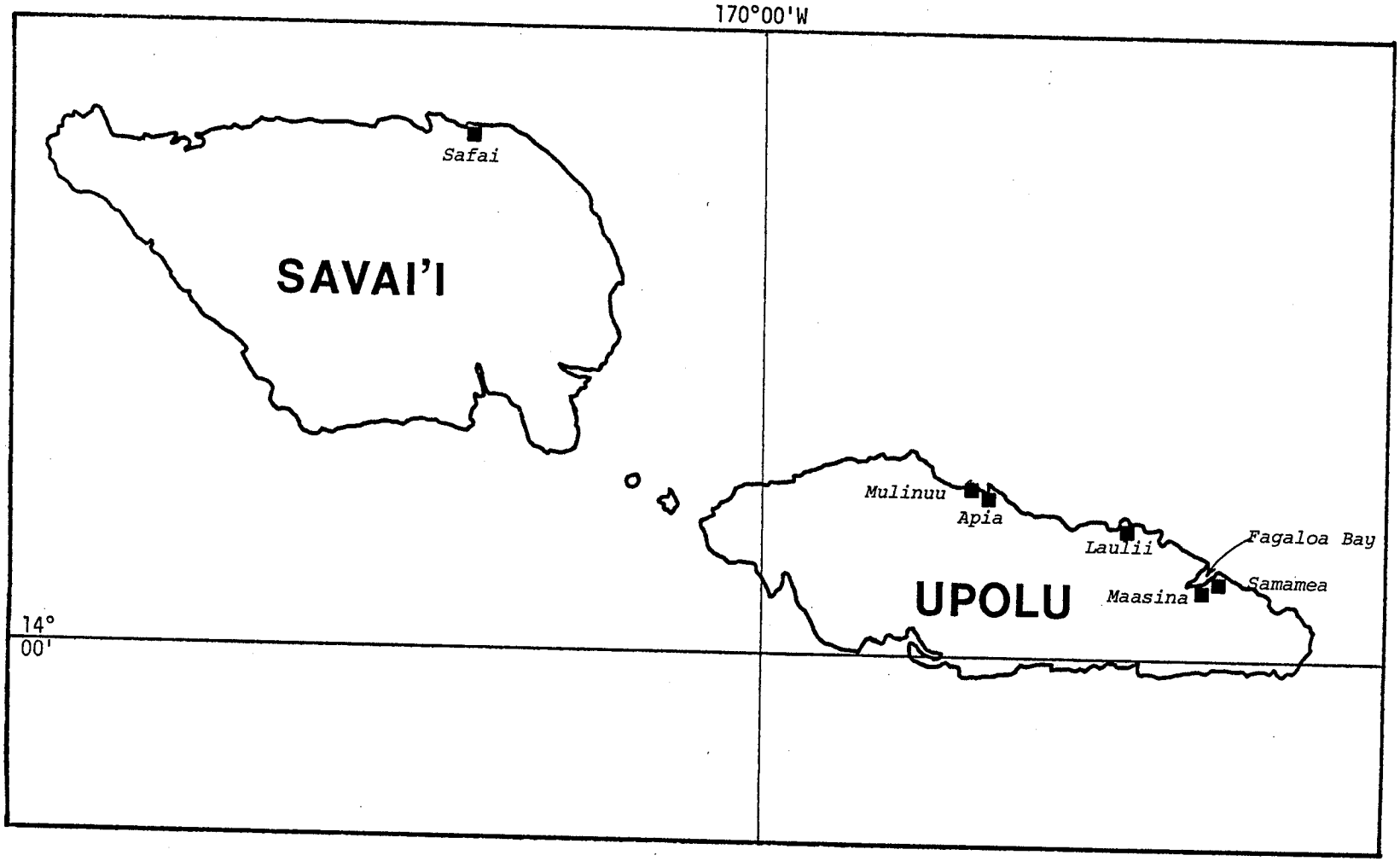
> *The tidal wave which Western Samoa experienced last Tuesday afternoon could have caused serious damage along Apia's foreshore if it had happened four hours later. The incoming tide was well below its high water level at 3.42 when the first effects of the tidal wave were recorded on the tide gauge at the Apia Observatory at Mulinu'u. The third surge was the first of a series of spectacular movements of the sea. Shortly after 4 o'clock, the inner harbour became almost empty, then back came the sea swirling toward the shore in a rush which sprayed water over the sea wall, and inundated low-lying areas... The highest reading of the tide at the Observatory was recorded at 8:50 p.m. when the oscillations were still quite large and the tide was at its maximum height.* (Anon., 1952)

The above was recorded in the "Samoa Bulletin" from Western Samoa dated November 7, 1952. No newspapers for the year 1952 and 1953 from American Samoa is available in Hawaii.

From the special publication of the Coast and Geodetic Survey titled, "The Tsunami of November 4, 1952 as Recorded at Tide Stations," the following information is obtained.

> *Apia, Western Samoa. The Observer-in-Charge, Apia Observatory reported: At 1 p.m. local time a further cable was received indicating that the wave had passed midway Island with an amplitude of approximately 5.8 feet. No further information was on hand when the first signs of a disturbance were noticed in Apia Harbour at about 3:45 p.m.*
>
> *The harbour was alternately drained to below low tide level*

Affected Areas by
Tsunami of November 4, 1952
in Western Samoa



exposing all the inner reef, and filled to over highest tide level at intervals of approximately 15 minutes. The rise (and fall) of water was approximately 4.5 feet at Apia Wharf although at the Observatory's tide gage in the lagoon, this was reduced to only 1.1 feet. The first indications on the tide gage were recorded at 3:35 local time when the water level began to rise.

The oscillations of the lagoon were visible for several hours and disturbances on the tide gage record at 10:00 a.m. The following morning still maintained the same periodicity. The highest water level was at 8:50 p.m. when the oscillations were still quite large and the tide was at its maximum height.

Some property damage was reported from Fagaloa Bay near the eastern end of Upolu where the wave built up into a 5 foot wall of water. A school and some other Samoan buildings were completely lost. No other extensive damage was reported and there was no loss of life. (Zerbe, 1953)

A copy of the tide gauge record showing tsunami at Pago Pago on November 5, 1952 is available. The 1952 tsunami was believed to be larger than the 1957 event. However, descriptions about this tsunami is very meager. Report from Apia Observatory provides a brief account of tide activities of various places in Western Samoa.

At the Observatory in Mulinuu, the tide gauge record was suffering from a friction effect at low tide. The first deflection was a strong rise at 15:35 on 4/11/52. Maximum range appears to be 2.1 ft. at 4:20 or 5 p.m. with a period of 25-30 minutes.

In the Apia Harbour the effect was considerably greater than that of 1946. Land around the Custom House was flooded to in depth of a few inches.

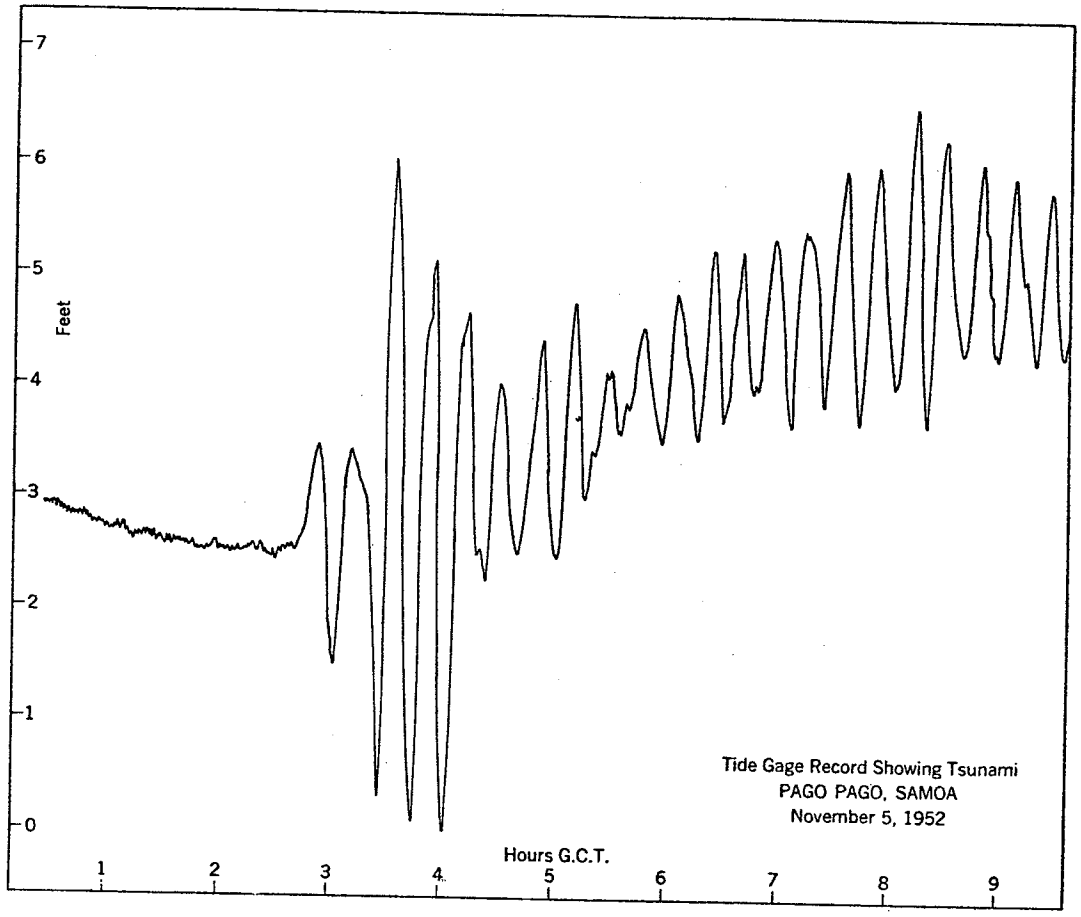
At Lauli'i the water penetrated up to the road, which was about 3 ft. above low tide mark on that day (the Tsunami arrived in Samoa at low tide in 1952). Thus the water range may have been 6 ft. or more.

At Ma'asina in Fagaloa Bay the range was about 9 ft. The water was observed to pile up into sinusoidal waves which travelled up the bay. There was approximately 3 such crests, probably becoming larger towards the head of the bay, although this is uncertain. Taelefaga at the head, suffered considerably, but it was difficult to find out more than this. The range was of the same order, probably greater.

At Samamea in Fagaloa Bay, according to the resident Pastor the first motion was a recession, and the maximum range was 5-6 ft. There were three large

waves. This information had to be obtained by letter. To the question "How long did the sea keep coming in and going out (e.g. one day, etc.)?", his answer was ½ hour. He was probably referring to the period of maximum activity. In any case, estimates of time are likely to be unreliable, as they do not usually have clocks.

At Safa'i in Savai'i, the 1952 tidal wave was much higher than the 1957 March one. (Apia, 1980)



September 13, 1953

The Preliminary Catalog of Tsunamis occurring in the Pacific Ocean lists that the earthquake of September 14, 1953 at Kandavu Passage of the Fiji Islands generated a small tsunami of 0.2 meter at Pago Pago. (Iida, et al, 1967)

No primary reports are located in the Samoa Bulletin or O le Fa'atonu. The 1953 issues of Samoa Times were not available for review.

March 9, 1957

A report from the Apia Observatory Western Samoa provides an account of this event in detail. Affecting areas are discussed individually. The report includes the following:

On the North coast of Upolu island, the following reports were obtained:

Faleolo Airport: The water level rose about one foot, once only. No other fluctuations were noticed.

Vaiusu Bay: The water current was apparently strong enough to damage a wire-netting fish-trap in the bay, but no inundation reports were received.

Mulinu'u Point: Noting the large earthquake on March 9th, although no warning has been received, a casual look out for a tsunami effect was kept, up till about 1:00 p.m. Nothing, apart from the general wave motion, was noticed, probably because of the non-continuity of the observations. The Observatory tide gauge, however, wrote a reasonable record of the disturbance; maximum height range one foot. Form Mulinu'u point around the Apia Harbour coastline, fluctuations of the sea were noticed at about 2 p.m. by two or three citizens who were swimming. No heights were quoted, but the main effects seem to have been the change in currents caused within the confining reef.

Lauli'i: Most of the coastal strip of land at the head of this bay is very low-lying, flat land, just above high water level. Consequently, greatest inundation amounted to about 50 yds. inland from high water mark at roughly 2:30 p.m. The height range was about 3 ft. maximum. Following waves were smaller and did not penetrate inland. There was a slightly increased effect up a shallow stream on the eastern corner of the bay. The wave following the inundation, travelled a short distance up this stream.

Tidal fluctuations appeared to have ceased by (roughly) 4 p.m. on the same day.

Saluafata Harbour: At Vailoa College, situated upon a hill next to the coast, no tsunami was noticed, probably because of lack of observations. At Saluafata Village the effect was marked. The first motion noticed, was a small recession of the sea, when the reef was exposed (at 11 or 12 o'clock). This was followed by a small advance. The next advance washed over a gently sloping sandy bank, carrying some light vegitation debris, and flowed underneath some Samoan houses on the inland side. The water therefore rose about 3 ft. above tide level on that day. This was followed by two smaller waves which failed to wash over the top of the bank. Altogether there were 3 or 4 prominent waves.

Piula: First motion was a recession at about 2 or 3 p.m. Four or five prominent waves occurred, the largest height range being about 3 ft. (from low tide to about 1 ft. above high tide).

Small surges continued all afternoon, while one observer said they continued till about Monday. The coast here being steeper, there was no inundation. A mile or two towards the east the coast is flatter and there was slight penetration by the sea, the main observed feature being the long-shore currents within the reef.

Fagaloa Bay:

a) Taelefaga: About two large rises of the sea, the greatest height range being about 5 ft. The inundation over the lower lying part of the village was about 25 yds., the sea washing into huts and depositing a canoe, with boy, inside a Samoan house. Sea receded past reef leaving it dry so that fish were gathered before sea returned. The sea came level with the slightly higher portion of the village without inundation.

Sea invaded land about 40 yds. towards the head of the bay. People began shifting furniture to higher ground from memory of the 1952 Tsunami. No wave crests occurred (i.e. no piling-up of the water into sine waves).

b) Ma'asina: There was an initial recession of the water (the time given for this was 3:30 p.m. but is probably quite unreliable). The height range was given as about 3½ ft., having receded 50-100 yds from high tide mark, and advancing just a little above that mark. About two such high rises occurred. Smaller oscillations continued for nearly 3 days, the periods being about half an hour. There were no wave crests.

c) Samamea: The Pastor of this village was absent at the time but according to other villagers no disturbance was noticed at all.

On the South coast of Upolu, no one at all appeared to have noticed the Tsunami. Enquiries were made at the following places:

Falelatai,
The eastern side of Lefaga Bay,
Sa'anapu,
Opposite to the Safata peninsula,
Si'umu - Short period waves noticed here, but almost certainly not connected with Tsunami.
Lotofaga - The people had heard the story of the Tsunami but had not noticed anything themselves.

Aufaga
and Lalomanu

Reports from the island of Savai'i: The following report was obtained through the Resident Commissioner of Savai'i.

Safa'i: The abnormal tide was first observed at about 2:30 p.m., on a rising tide. The initial direction was not noticed, but it appeared that the water may have first advanced.

There were four or five large movements of the water, the greatest height range being six feet or more.

Oscillations of the water continued only during the one afternoon.

The water came right up the beach, over the beach, over the road, on to the malae. The land is very flat here, approximately six feet above high water mark.

Waves also rushed up the creek at the back of the village. This creek is tidal and drains a swamp. The waves had sufficient force to demolish a stone causeway used by the villages to cross the creek to their plantation area.

There was no effect either in Sato'alepai or Saleaula, the villages immediately to the west and east respectively of Safa'i. Enquiries were made by the Commissioner along the north coast of Savai'i, but as far as could be ascertained, the Tsunami was experienced in only the one village, i.e., Safa'i which is near Fagamalo.

There was no effect noticed at Tuasivi.

Letters of enquiry were sent to Falealupo at the western end, and to Gaga'emalae on the south of Savai'i. No replies were received, so it seems probable that nothing was noticed at these places either.

Report from American Samoa: The following information was obtained from the Director of Public Works, Pago Pago.

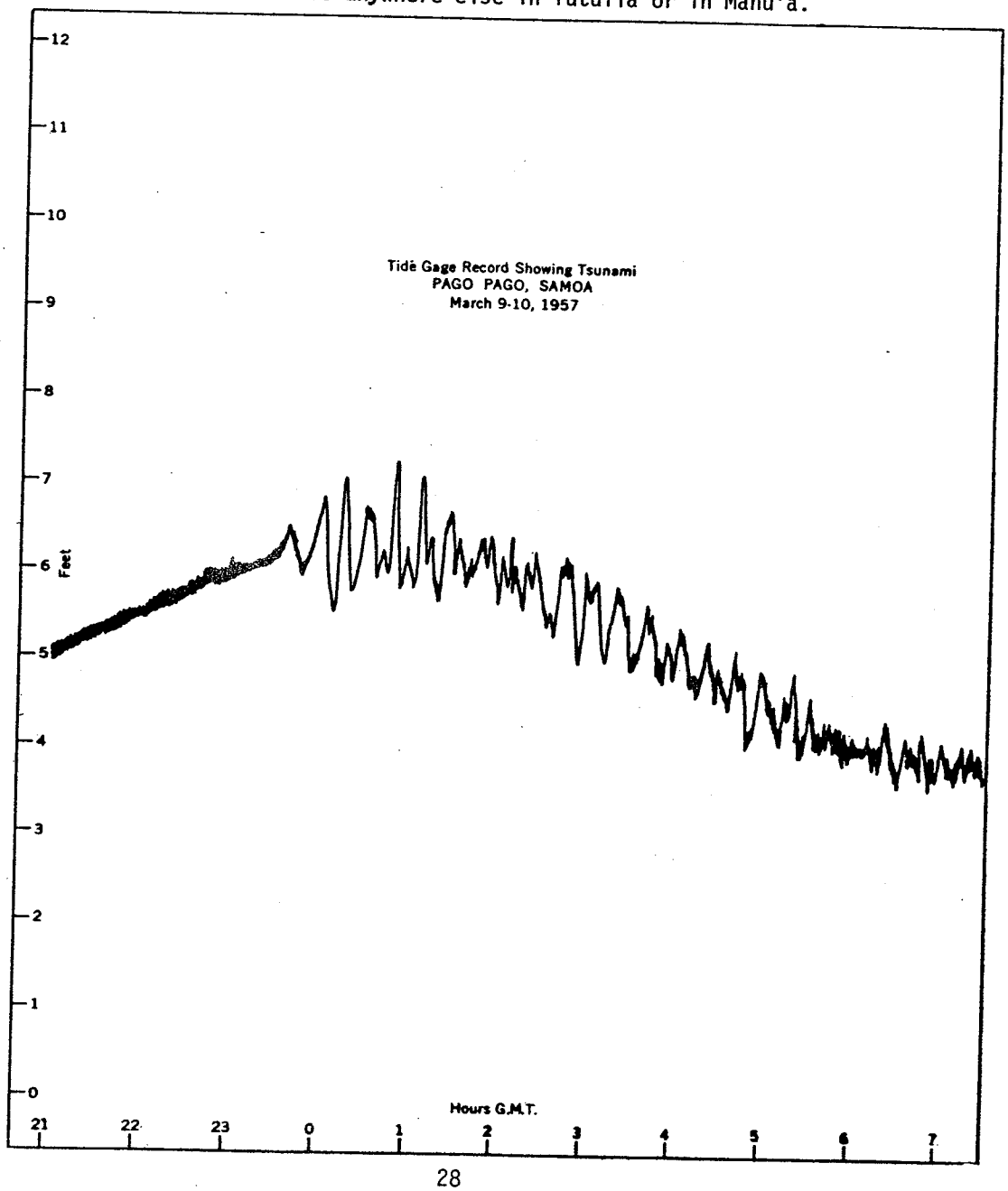
Pago Pago Harbour: The first motion was a recession of the water at 1248, although north shore people said it advanced.

At the Pago end of the harbour the sea went over the road which is 4 ft. above mean tide. Fagasa, the small bay on the north coast, had waves about 5 ft. higher than normal high tide. There were about 11 large size waves over a period of 1 hour and 50 minutes. The first three waves were approximately 14 minutes apart. About the 9th and 10th waves were coming in at about 8-9 minutes each -

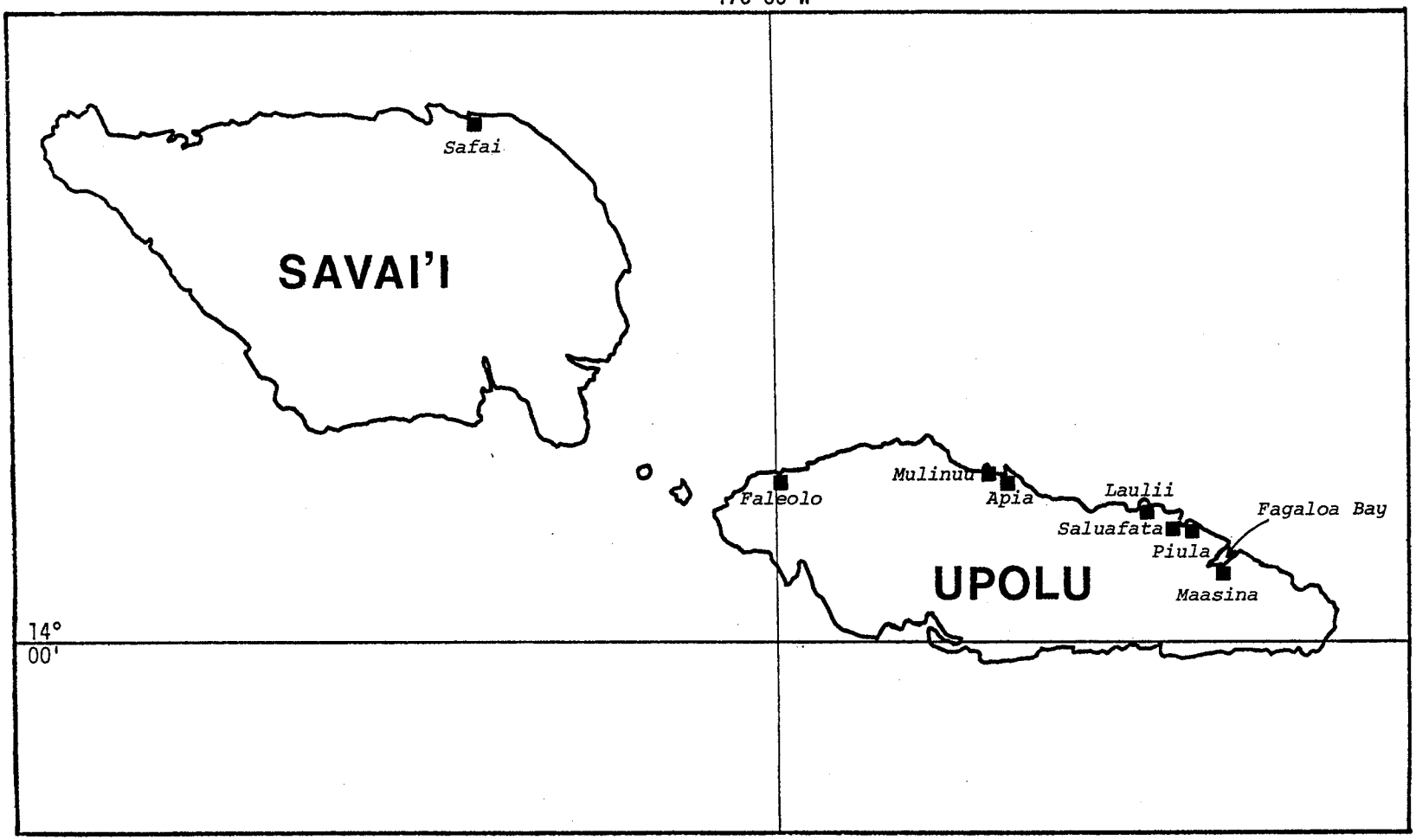
smaller and faster. The harbour kept on oscillating for approximately 5 hrs. At 6 p.m. there was still a slight disturbance, but north shore Fagasa Port showed fairly rough waters. There is no record as to how long Fagasa oscillated.

The Pago Pago Administration Tide Gauge charts were sent to U.S.C. & G. Survey Honolulu, T.H. No measurements from these charts had been made. (Apia, 1980)

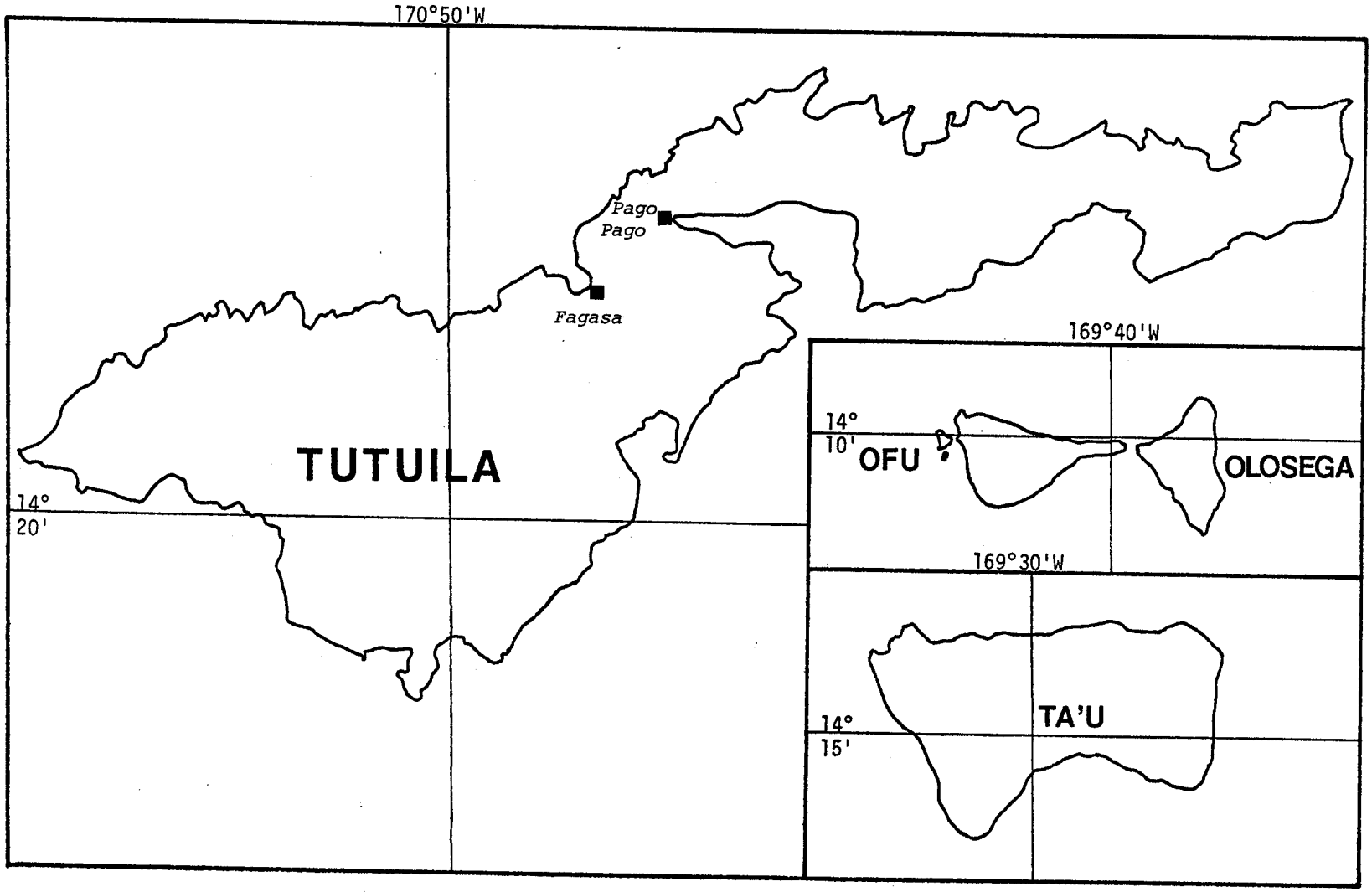
No reports were made anywhere else in Tutuila or in Manu'a.



Affected Areas by
Tsunami of March 9, 1957
in Western Samoa



Affected Areas by
Tsunami of March 9, 1957
in American Samoa



November 6, 1958

According to the Preliminary Catalog of Pacific Tsunamis, the November 6, 1958 earthquake at Iturup, South Kuril Islands generated a tsunami of 0.1 meter at Pago Pago. (Iida, et al, 1967) This is taken probably from a tide gauge record.

No other primary source information could be located.

May 22, 1960

The May 22, 1960 tsunami was undoubtedly one of the largest that has been recorded in the Samoa group. An extensive account of the event was written by Keys. The following are extracts from his report.

On the Island of Upolu

The first wave struck Samoa at about 2050 hours. Since it was not a serious one, it did not seem to have been observed.

The second wave arrived at 2345 hours and caused considerable damage at Aleipata and Fagaloa Bay.

At Apia Harbor, a wave displayed period of about 8 minutes at a range of about 4 feet was observed about midnight.

At Lalomanu, the tide approached full and the 2345 hours wave had picked up two fisherman in canoes near the reef and washed them onto the beach by the road. The crest had an amplitude of about 6 feet.

At Malaela, the wave action was unusually short -- about 4 minutes ranging about 6 feet on May 23.

At Fagaloa Bay, residents has observed unusual tide activity since 2115 hours, with an estimated range of about 6 feet and a period of approximately 10 minutes. At about 2345 hours, a great recession caused the sea to retreat beyond the reef, and a few minutes later, a crest advanced 90 yards through the village, rising to a height of approximately 8 feet above the normal tide. The range between crest and trough maxima was estimated at 14-15 feet. This wave caused damage at Fagaloa Bay and the peak water level reached the roof of one of the native houses. Debris was scattered about the village. No lives were lost.

Island of Savaii

Information from Savaii is incomplete according to Keys, due in part of the time that elapsed between the tsunami and the collection of information, and in part to the necessary use of an interpreter.

At Falelima. the tsunami seems to have been first observed on the northeast coast at 2100 hours. At 2345 hours, three large waves were observed with an estimated range of 8 or 9 feet and a period of about 30 minutes.

At Neiafu, one major crest was observed with a reported height of 7 to 8 feet. Times given were unreliable.

At Tufutafoe, two large crests were observed at approximately 2200 hours that attained a height of 6 to 7 feet, with a period of about 15 minutes.

At Sasina, the tsunami was not observed until approximately 0500 hours the next day because the bay entrance is enclosed by a reef. The peak range of the wave was about 5 feet with the period reported as about 30 minutes.

At Tuasivi, the shore is completely screened by a reef about 500 yards out. The tsunami have manifested itself as short-period surges, with peak ranges estimated at 4-5 feet.

The Island of Tutuila

The marigram at Pago Pago showed that the first wave arrived at approximately 2035 hours. Observers reported that there was approximately 10 wave crests and troughs with the third and fifth considered to be the largest and period estimated about 20 minutes.

800 yards farther up the bay, 6-7 feet peak amplitude was recorded above the normal tide at which time was on the ebb and approaching low water. The subsequent trough attained a maximum of approximately 4-5 feet, giving a range of approximately 10-12 feet.

Another half a mile up from the bay, five waves were observed of which the fourth was the largest. Maximum range here was estimated at 8-10 feet, crest to trough.

No tidal disturbance was noticed at Tafuna because it was screened by an offshore reef.

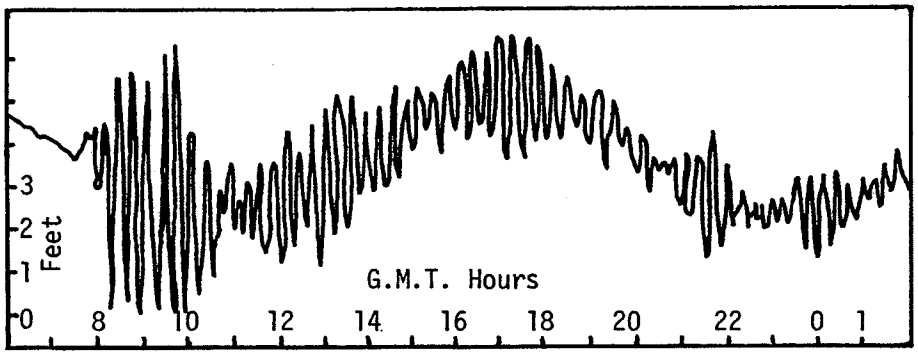
At Pago Pago village, which is located at the extreme west end of the harbor, the tsunami reached its greatest proportions in Samoa. The peak range here was 15.5 feet and damage estimated at $50,000 resulted. According to the analysis of the damage, it is reported:

One house was lifted and moved about 10 feet inland and another was washed into the bay by the outgoing wave. A school, substantially constructed on concrete piers, was rotated about a foot with consequent springing of nearly all structural members.

At Fagaalua, the sea rose no more than 2.5 feet.

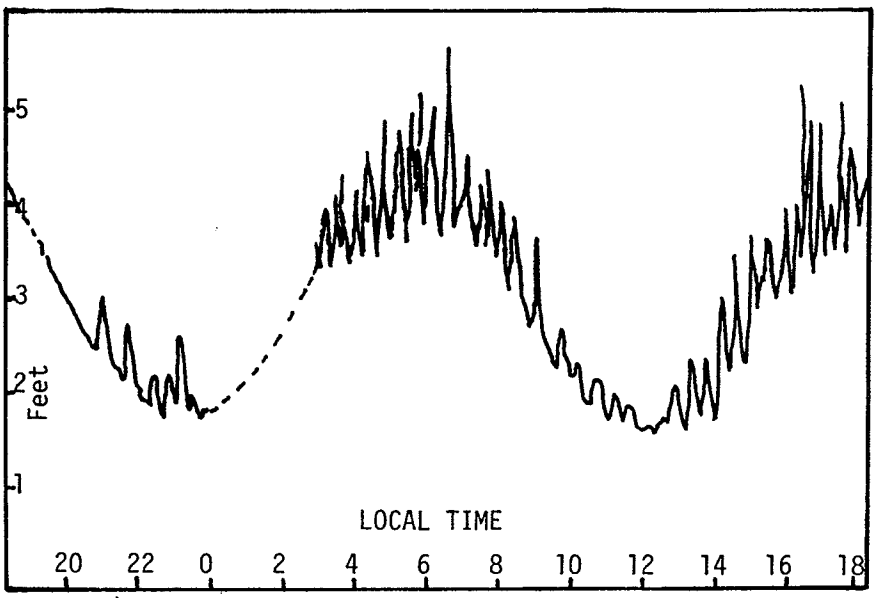
No reports of activity were obtained from other coastal villages. It seems evident that Pago Pago Harbor was the only location where the tsunami was observed. (Keys, 1963)

PAGO PAGO, AMERICAN SAMOA
May 23-24, 1960



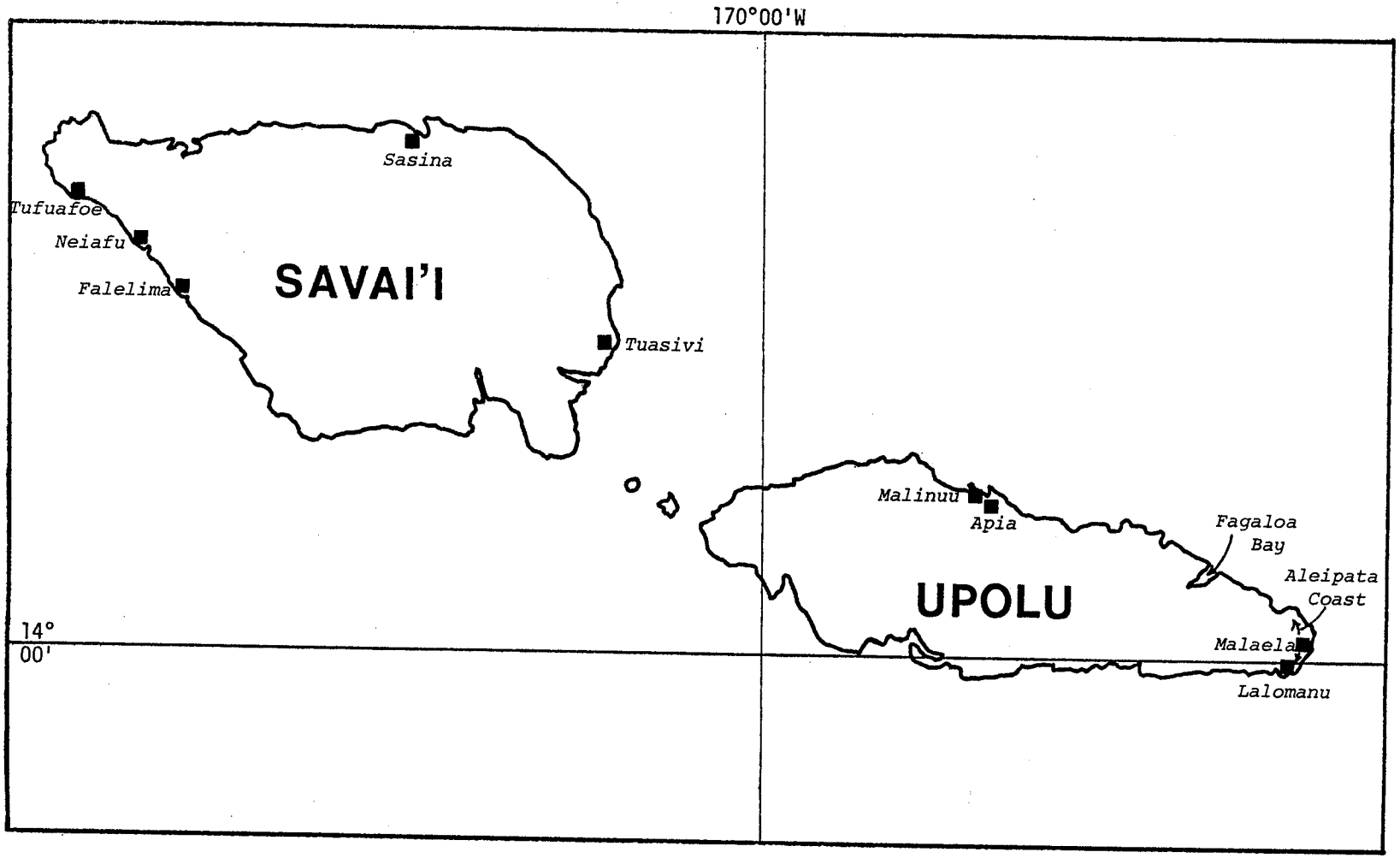
Marigram from Pago Pago Harbor, Tutuila, showing May 1960 Tsunami. (After Symons and Zetler, 1960)

APIA OBSERVATORY MARIGRAM
May 22-23, 1960

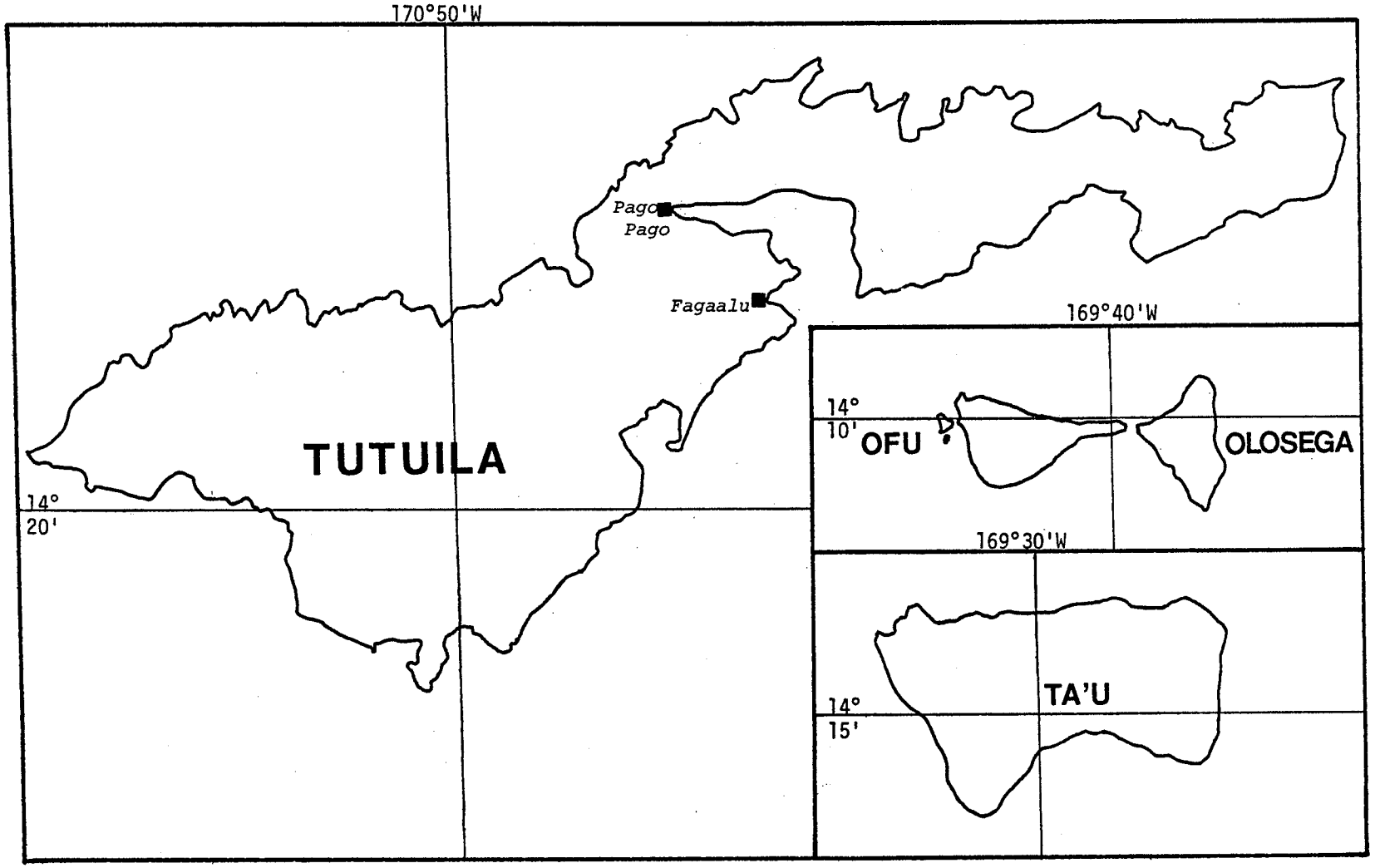


NOTE: 1) This is a reconstruction from the original. The dashed trace indicates that section of the original marigram missing as a result of faulty equipment.
2) The short period activity at high tide is caused by surf crossing the reef.

Affected Areas by
Tsunami of May 22, 1960
in Western Samoa



Affected Areas by
Tsunami of May 22, 1960
in American Samoa



February 13, 1963

An earthquake occurred in the north of Taiwan on February 13, 1963 generated a minor trace of tsunami recorded at the tide gauge of Pago Pago.

March 30, 1963

No earthquake data is available for this day. However, a minor trace of tsunami was recorded at the tide gauge of Pago Pago.

October 12, 1963

A severe earthquake in the Kurile Islands on October 12, 1963 resulted in a Pacific-wide tsunami alert. (Anon., 1963a) (Anon., 1963b) No sign of a wave was observed in Western Samoa. (Anon., 1963c) A 0.2 meter was observed in Pago Pago. (Iida, et al, 1967)

October 19, 1963

A small tsunami of 0.1 meter was recorded at Pago Pago by the earthquake of October 20, 1963 in S. Kuril Islands according to the Preliminary Pacific Tsunami Catalog. (Iida, et al, 1967) This is probably a value taken from a tide gauge record.

The Samoa News from Pago Pago reported that a tidal wave alert was given early that night but no other detail was provided. (Anon., 1963d)

The Samoana from Apia reported as follows:

> *A small amount of activity was recorded on the tide gauge at Apia Observatory and Observer-in-Charge, J. Milne said that he had received reports from several people of strong waves breaking at about 12:30 Saturday night.* (Anon., 1963e)

March 27, 1964

Western Samoa

> From the Samoa Bulletin: *The wave was first recorded at Apia about 4:30 a.m. on Friday, and half-tide fluctuations in Apia Harbor continued for eight hours. No flooding has been reported.* (Anon.,1964a)

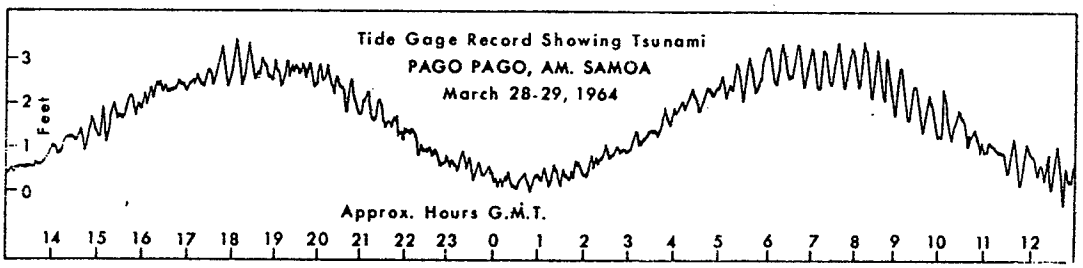
No other detail concerning the height of the wave can be located from any other sources.

American Samoa

From the U.S. Coast and Geodetic Survey reports (Spaeth & Berkman, 1965), a tide gage record was found showing the tsunami arriving at 1351 hours with a height of 1.3 feet.

No other sources concerning this event can be found.

The Samoa News of Pago Pago has no report indicating this tsunami.



June 16, 1964

An earthquake, with a magnitude of 7.5, occurred in Niigata, Yamagata of Japan on June 16 of 1964, generated local tsunamis and in Korea. A minor trace of tsunami was also recorded at the tide gauge of Pago Pago.

January 24, 1965

An earthquake that occurred in Sanana Island of Indonesia on January 24, 1965 generated a destructive tsunami locally which destroyed 90% of the city with 71 people killed. A minor trace of tsunami was also recorded at the tide gauge of Pago Pago.

February 4, 1965

An earthquake in the Rat Island of the Aleutian Island on February 4, 1965 caused local tsunamis and in Japan and Hawaii. A Pacific-wide warning was issued by the Seismic Sea Wave Warning System. A minor trace of tsunami was also generated in Pago Pago according to the tide gauge records.

March 29, 1965

Another earthquake in the Aleutian Island on March 30 of 1965, also generated a minor trace of tsunami in Pago Pago according to the tide gauge records.

July 2, 1965

On July 2, 1965 an earthquake occurred near Unalaska Island of the Aleutian Island caused local tsunami. A minor trace of tsunami was also recorded at the tide gauge of Pago Pago.

August 12, 1965

An earthquake occurred on August 12, 1965 in New Hebrides generated local tsunami and in Tonga. A minor trace of tsunami was also recorded at the tide gauge of Pago Pago.

October 17, 1966

A tidal wave warning was issued at Apia on October 16 evening and cleared early the following morning, according to the Samoa Bulletin from Apia. (Anon., 1966)

In Pago Pago, a 0.2 meter wave was recorded. (Anon., 1970)

December 28, 1966

An earthquake, with a magnitude of 7.5, near the coast of northern Chile generated local tsunami there and elsewhere across the Pacific. A 0.2 meter wave was observed at Pago Pago. (Anon., 1970)

No primary source of information is available from the University of Hawaii Library.

December 31, 1966

An earthquake of 7.5 magnitude in the Santa Cruz Islands on December 31, 1966 caused a small tsunami of 0.1 meter in Pago Pago. (Anon., 1970)

No primary source of information is available from the University of Hawaii Library.

March 31, 1968

A minor trace of tsunami was recorded at the tide gauge of Pago Pago on March 31, 1968. According to Wigen, 1977, an earthquake, with a magnitude of 6.2 occurred at 32.5°N, 132.2°E in the region of South Japan.

May 16, 1968

An earthquake off Honshu, Japan caused a small tsunami of 15 cm in Pago Pago. (Pararas-Carayannis, 1977)

No primary source of information can be located.

August 1, 1968

An earthquake occurred in Luzon of the Philippines on August 1, 1968 which generated a minor tsunami in Pago Pago according to the tide gauge record.

August 11, 1969

A tsunami watch was issued by Pacific Tsunami Warning Station as a result of an earthquake occurred in the Kuril Island on August 11, 1969. A minor trace of tsunami was recorded at the tide gauge of Pago Pago.

November 22, 1969

An earthquake occurred in the east coast of Kamchatka on November 22, 1969 resulted a minor trace of tsunami recorded at the tide gauge of Pago Pago.

July 14, 1971

An earthquake in New Ireland on July 14, 1971 generated a tsunami in the Pacific. A 6 cm wave was observed in Pago Pago. (Pararas-Carayannis, 1977)

No primary source of information can be found.

January 30, 1973

An earthquake on January 30, 1973 near the coast of Michoacan, Mexico, caused a minor tsunami of 21 cm at Pago Pago. (Coffman & Hake, 1975) (Anon., 1975a)

No primary source of information could be located regarding this event other than in the records of the International Tsunami Information Center and from tide gauge records at Pago Pago.

June 17, 1973

The Hokkaido, Japan earthquake of June 17, 1973 generated a small tsunami of 9 cm at Pago Pago. (Coffman & Hake, 1975) (Anon., 1975a)

No newspaper account could be located. The information above was obtained from the records of the International Tsunami Information Center and from tide gauge records at Pago Pago.

October 3, 1974

The earthquake of Lima, Peru occurred on October 3, 1974 generated a tsunami of 31 cm at Pago Pago. (Anon., 1976) (Coffman & Stover, 1976)

No other source of reference can be located from local newspapers. The information came from mareographic records of the tsunami at Pago Pago obtained by the International Tsunami Information Center.

November 29, 1975

The earthquake of November 29, 1975 at the Island of Hawaii generated minor tsunamis of 21 cm at Pago Pago and 34 cm at Apia. These heights were obtained from mareographic recordings. (Anon., 1979a)

December 26, 1975

On December 26, 1975, an earthquake, registering 7.6 on the Richter scale, approximately 200 miles south of Samoa at the northern end of the Tonga-Fiji ark (Anon., 1975b), generated a minor tsunami in the Samoan Islands which recorded 75 cm at Pago Pago and 15 cm at Apia. (Coffman & Stover, 1977) No damage resulted from the tsunami.

January 14, 1976

The Kermadec Islands earthquake on January 14, 1976 caused a minor tsunami in Apia with a height of 14 cm. (Coffman & Stover, 1978)

The Australian Domestic Service reported a 90 cm wave in the Southern Fiji islands, and a 15 cm wave at Suva.

April 2, 1977

The United States Earthquakes for 1977 lists an earthquake on April 2 in the Samoa Islands region which caused a minor tsunami that was recorded at Apia and Pago Pago. At Apia, the maximum amplitude was 4 cm and 15 cm at Pago Pago. (Coffman & Stover, 1979)

However, according to the Tsunami Reports published by ITIC, the maximum wave at Apia was 7 cm. Tsunami arrival at Pago Pago was at 0745 and the sea level disturbance lasted for about one hour. (ITIC, 1978a)

April 20, 1977

An earthquake in the Solomon Islands region (9.5 S, 160.4 E) on April 20, 1977 with a magnitude of 6.5 generated a tsunami of 4 cm maximum height at Apia. This value was taken from the tide gauge record. No tsunami was evident in the tide gauge record of Pago Pago. (ITIC, 1978b)

April 21, 1977

Another earthquake occurred in the same vicinity as the April 20 earthquake in the Solomon Islands (11.1°S, 160.7°E) with a magnitude of 7.5. This quake also generated a minor tsunami of 3 cm at Apia. No tsunami was evident in the tide gauge of Pago Pago. (ITIC, 1978c)

June 22, 1977

An earthquake in the Tonga Trench on June 22, 1977 generated a tsunami having a maximum height of 7 cm at Apia and of 13 cm at Pago Pago. (ITIC, 1978d)

October 10, 1977

The earthquake in the Tonga area with a magnitude of 6.9 caused a minor tsunami of 2 cm at Pago Pago. (ITIC, 1978e)

March 14, 1979

The Samoa News reported the following:

> *A major earthquake centered near the Pacific coast of Mexico that killed several people and injured dozens, caused a four inch tsunami (tidal wave) to reach American Samoa Wednesday morning at 11:45.* (Anon., 1979b)

KEY TO CATALOG

Column Heading	Notation	Explanation
DATE	?	Questionable tsunami
	1957 Mar 9	Local date of the initial observation of a tsunami or possible tsunami in the Samoan Is. : year, month, day.
EARTHQUAKE DATA		
Date	March 9	Universal date of earthquake (or eruption).
Time	14:22	Earthquake origin time given in universal time (UT): hours, minutes.
Epicenter	52.3 N 175.8 W	Latitude Longitude
Magnitude	8.3	Earthquake magnitude
	PAS	California Institute of Technology (Pasadena).
	G&R	Gutenberg and Richter, 1954
	CMO/JMA	Japan Central Meteorological Obsy./ Japanese Meteorological Agency
	TAO	Tokyo Astronomic Observatory
	CGS	U.S. - Coast and Geodetic Survey
Depth	60	Focal depth in kilometers.

Column Heading	Notation	Explanation
TSUNAMI DATA		
Area of Origin	Andreanof Is., Aleutian Is.	Name of general geographic area of tsunami origin.
M (Tsunami Magnitude)	3.5	Tsunami magnitude defined by $m=\log_2 H$ or $H=2^m$ as revised by Iida, et al. (1967), where H is the maximum runup height or amplitude on a coastline near the generating area.
	?	Magnitude not assigned because of special generating conditions.
Place of Observation	Samoa Tutuila I. Pago Pago	Places of reported observations: name of major geographic unit is shown first, followed by more precise names.
H (Height)	1.2	Maximum runup height or amplitude, in meters.
At	9.1	Travel time from origin, in hours.
T	22	Average period of the initial wave, in minutes.
Observations and Remarks	No damage.	Summary of behavior and effects, discussion of data, comments on sources of information. All times are local and for the same date as listed under "DATE" column unless otherwise indicated.
REFERENCES	Keys, 1957	Author, year of publication. (Primary reference containing Samoan data)
	Keys, 1957	Author, year of publication. (Secondary reference)
		(If no references are shown, the data have been extracted from mareographic records or unpublished reports.)

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1837 Nov 7	Nov 7 12:51 36-38 S	Near Valdivia and Concepcion, South Chile	3?	Samoa Tutuila I.				Great earthquake in South Chile resulted in large tsunami in the Hawaiian Islands with great loss of life and property. No details are available on effects in American Samoa but it was probably recorded.	Hitchcock, 1911 Iida, et al, 1967 Pararas-Carayannis, 1977
1868 Aug 14	Aug 13 16:45 18.5 S 71.0 W	Near Iquique and Arica, North Chile	4?	Samoa Upolu I. Apia		16.0		Great "Peru" earthquake and tsunami destroyed settlements. This event has been extensively documented in the literature, however no details could be found on the Samoan Islands.	Iida, et al, 1967 Pararas-Carayannis, 1977
1877 May 10	May 10 00:59 21.5 S 71.0 W	Near Iquique, Chile	4?	Samoa Upolu I. Apia	2-4	15		Great Chilean earthquake and tsunami resulting in extensive loss of life and property in Chile, Japan and elsewhere. No details about effects in American Samoa.	Iida, et al, 1967 Pararas-Carayannis, 1977
1883 Mar 24	Samoa Is.?	Samoa Is.?	1	Samoa Savaii I.				According to New York Times, an earthquake was accompanied by strong storm and big waves. All ships suddenly broke loose from their anchors. Houses within a quarter of a mile of the beach on the east end of the Island of Savaii were swept away for a distance of 15 miles along the shore. The possibility of a local tsunami cannot be excluded.	Anon., 1883 Fuchs, 1885 Soloviev, Go, 1969, 1975

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1896 Jun 15	Jun 15 10:33 39.6 N 144.2 E 7.6 TAO	Sanriku, Japan	4	Samoa Savaii I.				The great Meiji Sanriku tsunami caused great loss of life and property in Japan. No report of the tsunami in Samoa could be found other than in a letter of the U.S. Consul General to the Hydrographer U.S.N., stating the occurrence of a wave. No damage was reported.	Churchill, 1896 Iida, et al, 1967 Pararas-Carayannis, 1977
1905 - 1911		North coast of Savaii, Samoan Islands	0.5	Samoa Savaii I. N. Coast				Eruption of Matavanu volcano. Lava flows reached the coast. From time to time lava flows generated local waves of tsunami type. No details.	Anderson, 1910 Sapper, 1927 Richard, 1962
1906 Nov 28				Samoa Savaii I. Matautu				5:30 p.m. (local)	Anderson, 1910
1907 Jun 8				Matautu				12:00 noon (local)	
1907 Jun 19				Matautu				3:00 a.m. (local)	
1907 Jun 27				Matautu				Between 6 to 7:00 p.m. (local)	
1907 Jul 9				Matautu				6:45 p.m. (local)	
1907 Jul 25				Matautu				11:00 a.m. (local) The above six tsunamis occurred during the eruption of Matavanu Volcano in Savaii. Average rises and falls of the waves did not exceed 6 to 8 feet. Little damage was done.	

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1907 Oct 6				Samoa Savaii I. Matautu Upolu I. Apia	3- 3.6 0.3- 0.6			Several boats were damaged. A 400-gallon tank of water was lifted bodily from its foundation and carried across the road.	Anderson, 1910
1915 Feb 11	?	Samoa Is. ?	?	Samoa Manua I.				No earthquake occurred. New York Times, 1915 reported that not only a hurricane, but with it an earthquake and a "tidal wave", swept the Manua Islands of the Samoan group. Doubtful tsunami.	Anon., 1915
1917 May 1	May 1 18:26 29.0 S 177.0 W 8.0 G&R Shallow	Kermadec Is.	1?	Samoa Upolu I. Apia				Tsunami erroneously reported as 40 feet high in the Samoan Islands. This height was probably confused with height of June 25 tsunami which may have been also in error. A tsunami was probably generated on that date from the Kermadec earthquake, however, its height in the Samoan Islands could not be documented. The Apia tide gauge record is not available to verify this tsunami.	Anon., 1913 Heck, 1947 Iida, et al, 1967 Pararas-Carayannis, 1977 Apia, 1980

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1917 Jun 26	Jun 26 05:50 15.5 S 173.o W 8.3 G&R Shallow	Samoa Is.	3?	Samoa Upolu I. Apia	0.8		18	Wave arrived at about 0555 GMT.	Anon., 1917a Anon., 1917b Anon., 1921 Mayor, 1924 Heck, 1947 Iida, et al, 1967 Pararas-Carayannis, 1977 Apia, 1980
				Aleipata Coast	3			Destructive waves.	
				Lotogafa				Half of the village was submerged and houses destroyed.	
				Savaii I. Palauli				A bridge was washed away and a number of native houses destroyed.	
				Satupaitea				A copra house was carried down the coast by the wave for about a quarter of a mile, and all native houses demolished.	
				Tutuila I. Pago Pago	1.8-2.4			First motion was a recession. Destruction of many Samoan houses. Mormon church in Pago Pago and Catholic church in Leone partly demolished.	
1918 Sep 7	Sep 7 17:16 45.5 N 151.5 E 8.25 G&R Shallow	S. Kuril Is.	3.6	Samoa				Earthquake at S. Kuril Island generated tsunamis locally, and in Japan, and Hawaii resulting in loss of life and property.	Anon., 1918 Iida, et al, 1967 Pararas-Carayannis, 1977 Apia, 1980
				Upolu I. Apia	0.4	9.7	20	No damage was reported.	
				Sogi	0.3	12.7		Sudden recession occurred 3 hours later, followed by a wave of about 0.3 meter.	
				Savaii I. Safune	0.3?			Same phenomenon as at Sogi occurred at Safune	

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1919 Apr 30	Apr 30 07.17 19.0 S 172.5 W 8.3 G&R Shallow	Tonga Is.	1	Samoa Upolu I. Apia Tutuila I.	 0.37 1.8- 2.4	 0.9		No details of tsunami. First motion was a recession of about 2 meters. No indication of where these observations were made of the tsunami occurred on the Island of Tutuila. A 2.5 meter wave was reported at Haapai, Tonga Island.	Anon., 1919b Mayor, 1924 Heck, 1947 Iida, et al, 1967 Pararas-Carayannis, 1977 Apia, 1980
1920 Aug --	?	Samoa Is.	?	Samoa Upolu I. Near Apia				No earthquakes were recorded at Apia during August. Reports of an earthquake and tsunami given in the literature are probably in error. Probably a confused re-entry of the September 21 tsunami.	Mayor, 1924 Heck, 1947 Iida, et al, 1967 Apia, 1980
1920 Sep 20	Sep 20 14:39 20.0 S 168.0 E 8.0 G&R Shallow	New Hebrides	1?	Samoa Upolu I. Apia		4.4?		No tide gauge record is available. First wave reached Apia at 1904 GMT.	Angenheister, 1923 Heck, 1947 Gutenberg & Richter, 1954 Keys, 1957 Iida, et al, 1967 Apia, 1980

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1922 Nov 11	Nov 11 04:33 28.5 S 70.0 W 8.3 G&R Shallow	North Chile	3?	Samoa Upolu I. Apia Tutuila I. Pago Pago	 1.8	 14.1 	 20	 First wave reached Apia at 1836 GMT. Slight damage. No details available.	Iida, et al, 1967 Pararas-Carayannis, 1977 Apia, 1980
1923 Feb 3	Feb 3 16:02 54.0 N 161.0 E 8.3 G&R Shallow	East Kamchatka	3?	Samoa Upolu I. Apia		 9.7		The earthquake of East Kamchatka generated local tsunamis and tsunamis in Japan, Hawaii and elsewhere causing considerable damage. No details could be found for the Samoan Islands except that the wave was recorded and that the rise and fall of the water was small. No information could be found on American Samoa. First wave reached Apia at 0142 GMT.	Anon., 1923 Heck, 1947 Keys, 1957 Iida, et al, 1967 Pararas-Carayannis, 1977 Apia, 1980
1926 Mar 16 ?	Mar 16 17:32 16.5 S 171.0 W 6.0 G&R Shallow	Samoa ?		Samoa ?				A tsunami swept over Palmerston Island (Cook Island). No Samoan report of a tsunami nor seismic activity according to Apia seismogram and tide records. Doubtful tsunami.	Heck, 1947 Keys, 1957 Iida, et al, 1967 Apia, 1980

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1928 Jun 17	Jun 17 03:19 16.25 N 98.0 W 7.8 G&R Shallow	New Acapulco, Mexico	1?	Samoa Upolu I. Apia		14.7	20	About three prominent cycles appeared on the mareogram. First wave began at about 0450 local time. Period was approximately 20 minutes. No other details.	Keys, 1957 Iida, et al, 1967 Pararas-Carayannis, 1977 Apia, 1980
1932 Jun 3	Jun 3 10:37 19.5 N 104.3 W 8.1 G&R Shallow	Jalisco, Mexico	2?	Samoa Upolu I. Apia	0.7		20-25	Recorded but no other details. First wave arrived at about 1045 local time. Wave had a period of 20-25 minutes and a range of 0.76 meters.	Keys, 1957 Iida, et al, 1967 Pararas-Carayannis, 1977 Apia, 1980
1933 Mar 2	Mar 2 17:31 39.1 N 144.7 E 8.3 CMO 0-20	Sanriku, Japan	4.8	Samoa Upolu I. Apia			30	The great Sanriku tsunami which caused great loss of life and property damage in Japan as also recorded at Apia. No other details could be found.	Keys, 1957 Iida, et al, 1967 Pararas-Carayannis, 1977 Apia, 1980

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1944 Dec 7	Dec 7 04:35 33.7 N 136.2 E 8.0 CMO 0-30	Kii, Japan	2.9	Samoa Upolu I. Apia	0.5		20	Minor tsunami recorded at the tide gauge at about 0900-1100 local time.	Iida, et al, 1967 Pararas-Carayannis, 1977 Apia, 1980
1946 Apr 1	Apr 1 12:29 53.5 N 163.0 W 7.4 G&R Shallow	E. Aleutian Is	5?	Samoa Upolu I. Apia	2.4?	9.4	25	Great (Eastern) Aleutian Tsunami First wave was a recession. Six oscillation were observed over a period of about 2 hours No damage recorded.	Anon., 1946 Iida, et al, 1967 Pararas-Carayannis, 1977 Apia, 1980
				Tutuila I. Pago Pago	1.5?			Several huts in the village of Pago Pago were washed away; according to eyewitness accounts from officers of the MV Honda Knot.	
1948 Sep 8	Sep 8 15:09 21.0 S 174.0 W 7.8 G&R Shallow	Tonga Is.	1?	Samoa Tutuila I. Pago Pago	0.1		17	Unofficial warning was issued by SSWWS.	Iida, et al, 1967

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1952 Mar 4	Mar 4 01:23 42.2 N 143.8 E 8.1 CMO 45	Tokachi, Hokkaido, Japan	2.0	Samoa Tutuila I. Pago Pago				A minor trace of tsunami recorded at the tide gauge.	Iida, et al, 1967 Pararas-Carayannis, 1977 Wigen, 1977
1952 Mar 10	Mar 9 17:04 42.5 N 143.0 E 7.1 CMO 33	S. E. Hokkaido	2.5	Samoa Tutuila I. Pago Pago				A minor trace of tsunami recorded at the tide gauge.	Iida, et al, 1967 Wigen, 1977
1952 Mar 17	Mar 18 03:58 19.1 N 155.0 W	Off S. Shore Hawaii Is.	?	Samoa Tutuila I. Pago Pago				A minor trace of tsunami recorded at the tide gauge.	Iida, et al, 1967 Pararas-Carayannis, 1977 Wigen, 1977

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1952 Mar 19	Mar 19 10:57 9.5 N 127.25 E 7.75 G&R Shallow	Mindanao, Philippines	?	Samoa Tutuila I. Pago Pago				A minor trace of tsunami recorded at the tide gauge.	Iida, et al, 1967 Wigen, 1977
1952 May 13	May 13 19:32 10.5 N 85.0 W 7.0 PAS 100 CGS	Costa Rica	-3	Samoa Tutuila I. Pago Pago				A minor trace of tsunami recorded at the tide gauge.	Iida, et al, 1967 Wigen, 1977
1952 Jul 13	Jul 13 11:59 18.5 S 167.5 E 7.0 PAS 260 CGS	New Hebrides		Samoa Tutuila I. Pago Pago				A minor trace of tsunami recorded at the tide gauge.	Iida, et al, 1967 Wigen, 1977

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1952 Nov 4	Nov 4 16:58 52.8 N 159.5 E 8.25 G&R 30-60	East Kamchatka	4	Samoa				Great Kamchatka Tusnami. Pacific-wide warning was issued by SSWWS.	Anon., 1952 Zerbe, 1953 Iida, et al, 1967 Pararas-Carayannis, 1977 Apia, 1980
				Tutuila I. Pago Pago	1.8?	9.7	18	Some damage. No detail.	
				Upolu I. Apia	1.35	9.6	15	Third recession was followed by rushing wave which inundated low-lying areas. Land around the Custom House was flooded to in depth of a few inches. Oscillations lasted several hours.	
				Fagaloa Bay	1.5			A school and some other Samoan buildings were completely lost. No other extensive damage was reported and there was no loss of life.	
				Mulinuu	0.63		25-30.		
				Lauli'i	0.9			Water penetrated up the road.	
				Ma'asina	2.7			Three prominent crests.	
				Taelefaga	2.7			Suffered considerably. Probably greater tsunami than at Ma'asina.	
				Samamea	1.5-1.8			First motion a recession.	
				Savaii I. Safa'i				Wave higher than 1957 March one but no other detail.	

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1953 Sep 13	Sep 14 00:27 18.5 S 178.5 E 6.75 PAS 60	Kandaru Passage, Fiji Is.	1?	Samoa Tutuila I. Pago Pago	0.2			No details for the Samoan Islands. Waves of 1.5 meter at Bega Island and 3 meters at Suva (Fiji Islands) were reported.	Iida, et al, 1967 Pararas-Carayannis, 1977
1957 Mar 9	Mar 9 14:22 51.3 N 175.8 W 8-8.5 PAS Shallow	Andreanof Is., Aleutian Is.	3.5 ?	Samoa Upolu I. Faleolo	0.3?			Pacific wide warning was issued by SSWWS. Water level rose once only.	Iida, et al, 1967 Pararas-Carayannis, 1977 Apia, 1980
				Mulinu'u	0.3?				
				Apia	0.3?	9.0	25		
				Lauli'i	0.9				
				Saluafata Village	0.9			3 or 4 prominent waves.	
				Fagaloa Bay Taelefaga	1.5			The inundation over the lower lying part of the village was about 25 yards, the sea washing into huts and depositing a canoe, with boy, inside a Samoan house.	
				Ma'asina	1.05				
				Savaii I. Safa'i	1.8			The waves had sufficient force to demolish a stone causeway used by the villages to cross creek to their plantation area.	

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1957 Mar 9 (cont.)				Tutuila I. Pago Pago	1.2?	9.1	22		
				Fagasa	1.5			Eleven large size waves over a period of one hour and fifty minutes.	
1958 Nov 7	Nov 6 22:58 44.5 N 148.5 E 8.25 SSI	Iturup, S. Kuril Is.	2?	Samoa Tutuila I. Pago Pago	0.1	9.9	22	Pacific-wide warning was issued by SSWWS.	Iida, et al, 1967 Pararas-Carayannis, 1977
1960 May 22	May 22 19:11 39.5 S 74.5 W 8.5 PAS	S. Chile	0?	Samoa				Great Chile tsunami. Tremendous damage and many casualties in Chile, Hawaii and Japan. A Pacific-wide warning was issued by SSWWS.	Anon., 1960 Cox, 1961 Keys, 1963 Berkman & Symons, 1964 Iida, et al, 1967 Pararas-Carayannis, 1977
				Upolu I. Apia	1.5	12.3	8		
				Lalomanu	1.8			Two fisherman in canoes near the reef had been picked up by the wave and washed onto the beach by the road.	
				Fagaloa Bay	1.8-2.4		10	Caused damage. The peak water level reached the roof of one of the native houses. Debris was scattered about the village. No lives were lost.	

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1960 May 22 (cont.)				Savaii I. Falelima	2.4-2.7		30	Three large waves.	
				Neiafu	2.1-2.4				
				Tututafoe	1.8-2.1		15		
				Tuasivi	1.2-1.5			Screened by a reef about 500 yards out. Tsunami manifested as short-period surges.	
				Tutuila I. Pago Pago	3-3.6	12.4	20	Damage at Pago Pago Village estimated $50,000.	
				Fagaalua	0.75				
May 23				Upolu I. Malaela	1.8		4		
				Savaii I. Sasina	1.5		30		
1963 Feb 13	Feb 13 08:50 24.5 N 122.1 E 7.25 CGS 47	N. Taiwan	-2	Samoa Tutuila I. Pago Pago				A minor trace of tsunami recorded at the tide gauge.	Iida, et al, 1967

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1963 Mar 30		Dixon Entrance?		Samoa Tutuila I. Pago Pago				A minor trace of tsunami recorded at the tide gauge. However, no earthquake data can be found.	
1963 Oct 13	Oct 12 05:18 44.8 N 149.5 E 8.25 PAS 60	S. Kuril Is.	2?	Samoa Tutuila I. Pago Pago	0.1	9.6	14	A Pacific-wide warning was issued by SSWWS. Recorded.	Iida, et al, 1967 Pararas-Carayannis, 1977
1963 Oct 20	Oct 20 00:53 44.7 N 150.7 E 6.75-7 PAS 25	S. Kuril Is.	3.5 ?	Samoa Tutuila I. Pago Pago Upolu I. Apia	0.1	9.8	18	A Pacific-wide warning was issued by SSWWS. Strong waves breaking reported.	Anon., 1963a Anon., 1963b Iida, et al, 1967 Pararas-Carayannis, 1977
1964 Mar 27	Mar 28 03:36 61.1 N 147.7 W	Gulf of Alaska	4.5	Samoa Tutuila Pago Pago	0.39	10.3	20	Great Alaska (Prince William Sound) earth quake. Recorded	Anon., 1964a Anon., 1964b Spaeth & Berkman, 1965, 1967 Iida, et al, 1967 Pararas-Carayannis, 1977

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1964 Mar 27 (cont.)	8.4 CGS 33			Upolu I. Apia					
1964 Jun 16	Jun 16 04:02 38.3 N 139.2 E 7.5 JMA 40	Niigata - Yamagata	2.5	Samoa Tutuila I. Pago Pago				A minor trace of tsunami recorded at the tide gauge.	Iida, et al, 1967
1965 Jan 24	Jan 24 00:11 2.4 S 126.0 E 7.5-7.75 PAS 6	Indonesia Mollucas Sanana Is.	2?	Samoa Tutuila I. Pago Pago				A minor trace of tsunami recorded at the tide gauge.	Iida, et al, 1967
1965 Feb 4	Feb 4 05:01 51.3 S 178.6 E 7.75 PAS 40	Rat Is., Aleutian Is.	3	Samoa Tutuila I. Pago Pago				A Pacific-wide warning was issued by SSWWS. A minor trace of tsunami recorded at the tide gauge.	Iida, et al, 1967 Pararas-Carayannis, 1977

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1965 Mar 29	Mar 30 02:27 50.6 N 177.9 E 7.3 PAS 51	Aleutian Is.	-1?	Samoa Tutuila I. Pago Pago				A minor trace of tsunami recorded at the tide gauge.	Pararas-Carayannis, 1977
1965 Jul 2	Jul 2 20:59 53.1 N 167.6 W 6.9 PAS 59	Near Unalaska I., Aleutian Is.	-1?	Samoa Tutuila I. Pago Pago				A Pacific-wide warning was issued by SSWWS. A minor trace of tsunami recorded at the tide gauge.	Pararas-Carayannis, 1977
1965 Aug 12	Aug 11 22:32 15.8 S 167.2 E 6.4 CGS	New Hebrides	1.5 ?	Samoa Tutuila I. Pago Pago				A minor trace of tsunami recorded at the tide gauge.	Iida, et al, 1967
1966 Oct 17	Oct 17 21:42 10.7 S 78.7 W	Near Coast of Peru		Samoa Tutuila I. Pago Pago	0.1			A Pacific-wide warning was issued by SSWWS. Recorded.	Anon., 1966 Iida, et al, 1967 Anon., 1970

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1966 Oct 17 (cont.)	7.5 PAS 38								Pararas-Carayannis, 1977
1966 Dec 28	Dec 28 08:18 25.5 S 70.7 W 7.75 PAS 47	Near Coast of Northern Chile		Samoa Tutuila I. Pago Pago	0.2			A watch was issued by the International Tsunami Warning Center at Honolulu Observatory.	Anon., 1970
1966 Dec 31	Dec 31 18:23 11.8 S 166.5 E 7.5 PAS 33	Santa Cruz Is.		Samoa Tutuila I. Pago Pago	0.1				Anon., 1970
1968 Mar 31	Apr 1 00:42 32.5 N 132.2 E 6.2? 33			Samoa Tutuila I. Pago Pago				A minor trace of tsunami recorded at the tide gauge.	Wigen, 1977

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1968 May 15	May 16 00:49 40.8 N 143.2 E 7.9 CGS 7	Off Honshu, Japan		Samoa Tutuila I. Pago Pago	0.15			Arrival time indefinite.	Pararas-Carayannis, 1977
1968 Aug 1	Aug 1 20:19 16.5 N 122.2 E 7.0 PAS 36	Philippine Is. Luzon		Samoa Tutuila I. Pago Pago				A minor trace of tsunami recorded at the tide gauge.	Pararas-Carayannis, 1977
1969 Aug 11	Aug 11 21:27 43.5 N 147.4 E 7.8 PAS 28	Kuril Is.		Samoa Tutuila I. Pago Pago				A minor trace of tsunami recorded at the tide gauge.	Pararas-Carayannis, 1977

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1969 Nov 22	Nov 22 23:09 57.8 N 163.5 E 7.1 PAS 33	East Coast of Kamchatka		Samoa Tutuila I. Pago Pago				A minor trace of tsunami recorded at the tide gauge.	Pararas-Carayannis, 1977
1971 Jul 14	Jul 14 06:11 5.5 S 153.9 E 7.7 PAS 47	New Ireland		Samoa Tutuila I. Pago Pago	0.06 ?			A Tsunami watch was issued by PTWS.	Pararas-Carayannis, 1977
1973 Jan 30	Jan 30 21:01 18.5 N 103.0 W 7.3 PAS 43	Near coast of Michoacan, Mexico		Samoa Tutuila I. Pago Pago Upolu I. Apia	0.22 0.09			0.21 at 08:18 (31st January)	Anon., 1975a Coffman & Hake, 1975 Pararas-Carayannis, 1977

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1973 Jun 17	Jun 17 03:55 43.2 N 145.8 E 7.7 PAS 48	Hokkaido, Japan		Samoa Tutuila I. Pago Pago	0.09			Tsunami watch was issued by PTSW.	Anon., 1975a Coffman & Hake, 1975 Pararas-Carayannis, 1977
1974 Oct 3	Oct 3 14:21 12.3 S 77.8 W 7.5 PAS 13	Near coast of Peru		Samoa Tutuila I. Pago Pago	0.31				Anon., 1976 Coffman & Stover, 1976 Pararas-Carayannis, 1977
1975 Nov 29	Nov 29 14:47 19.33 N 155.01 W 7.2 PAS 47	Hawaii, near Kilauea Crater		Samoa Tutuila I. Pago Pago	0.21			No other details.	Pararas-Carayannis, 1977 Anon., 1979a

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1975 Dec 26	Dec 26 15:56 16.3 S 172.5 W 7.6 G&R	Tonga Trench		Samoa Tutuila I. Pago Pago Upolu I. Apia	 0.75 0.15			No other details.	Anon, 1975b Coffman & Stover, 1977
1976 Jan 14	Jan 14 28.4 S 177.7 W 8.0 MS	Kermadec Is.		Samoa Upolu I. Apia	 0.14			No details.	Coffman & Stover, 1978
1977 Apr 2	Apr 2 07:15 16.2 S 171.6 W 7.2	Tonga Trench		Samoa Tutuila I. Pago Pago Upolu I. Apia	 0.15 0.07	 0.6 0.5	 18 12	Small tsunami recorded.	Coffman & Stover, 1979 ITIC, 1978a
1977 Apr 20	Apr 20 23:13	Solomon Is.		Samoa Upolu I. Apia	 0.04	 6.5	 13	Recorded. No details.	ITIC, 1978b

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1977 Apr 20 (cont.)	9.5 S 160.4 E 6.5 33+								
1977 Apr 21	Apr 21 04:24 11.1 S 160.7 E 7.5 33+	Solomon Is.		Samoa Upolu I. Apia	0.03	6.75	15	Recorded. No details.	ITIC, 1978c
1977 Jun 22	Jun 22 12:08 20.9 S 177.4 W 7.0 65	Tonga Trench		Samoa Tutuila I. Pago Pago	0.13	1.2	18	Recorded. No details.	ITIC, 1978d
1977 Oct 10	Oct 10 11:54	Tonga Tench		Samoa Tutuila I. Pago Pago	0.02	0.9		Recorded. No details.	ITIC, 1978e

DATE	EARTHQUAKE DATA	TSUNAMI DATA							REFERENCES
		AREA OF ORIGIN	M	PLACE OF OBSERVATION	H	ΔT	T	OBSERVATIONS AND REMARKS	
1977 Oct 10 (cont.)	26.1 S 175.3 W 6.9 33+								
1979 Mar 14	Mar 14 11:07 17.82 N 101.26 W	Pacific Coast of Mexico		Samoa Tutuila I. Pago Pago	0.1			Minor tsunami. No damage reported.	Anon., 1979b ITIC, 1979

APPENDIX

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